OFFICIAL PUBLICATION OF THE PROCEEDINGS AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS

AMERICAN

DYESTUFF REPORTER

DEVOTED TO TEXTILE CHEMISTRY • BLEACHING • DYEING • PRINTING • FINISHING

APRIL 3, 1950
VOLUME 39, NO. 7

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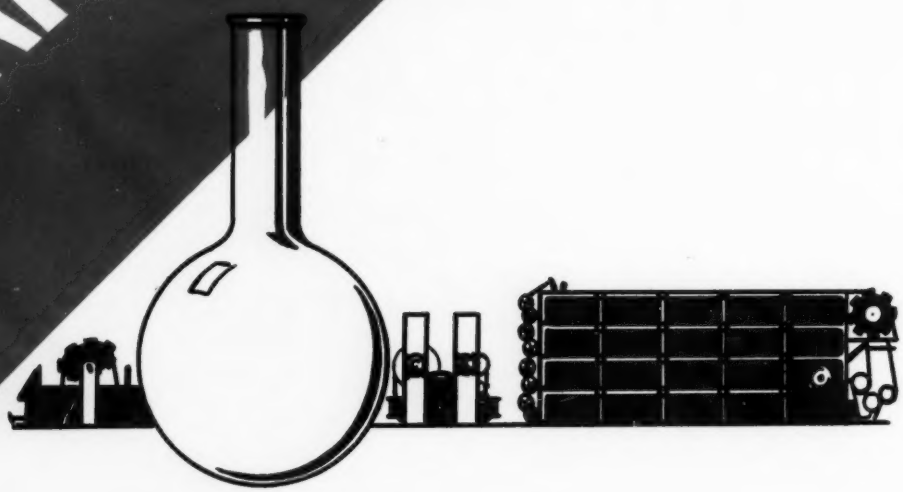

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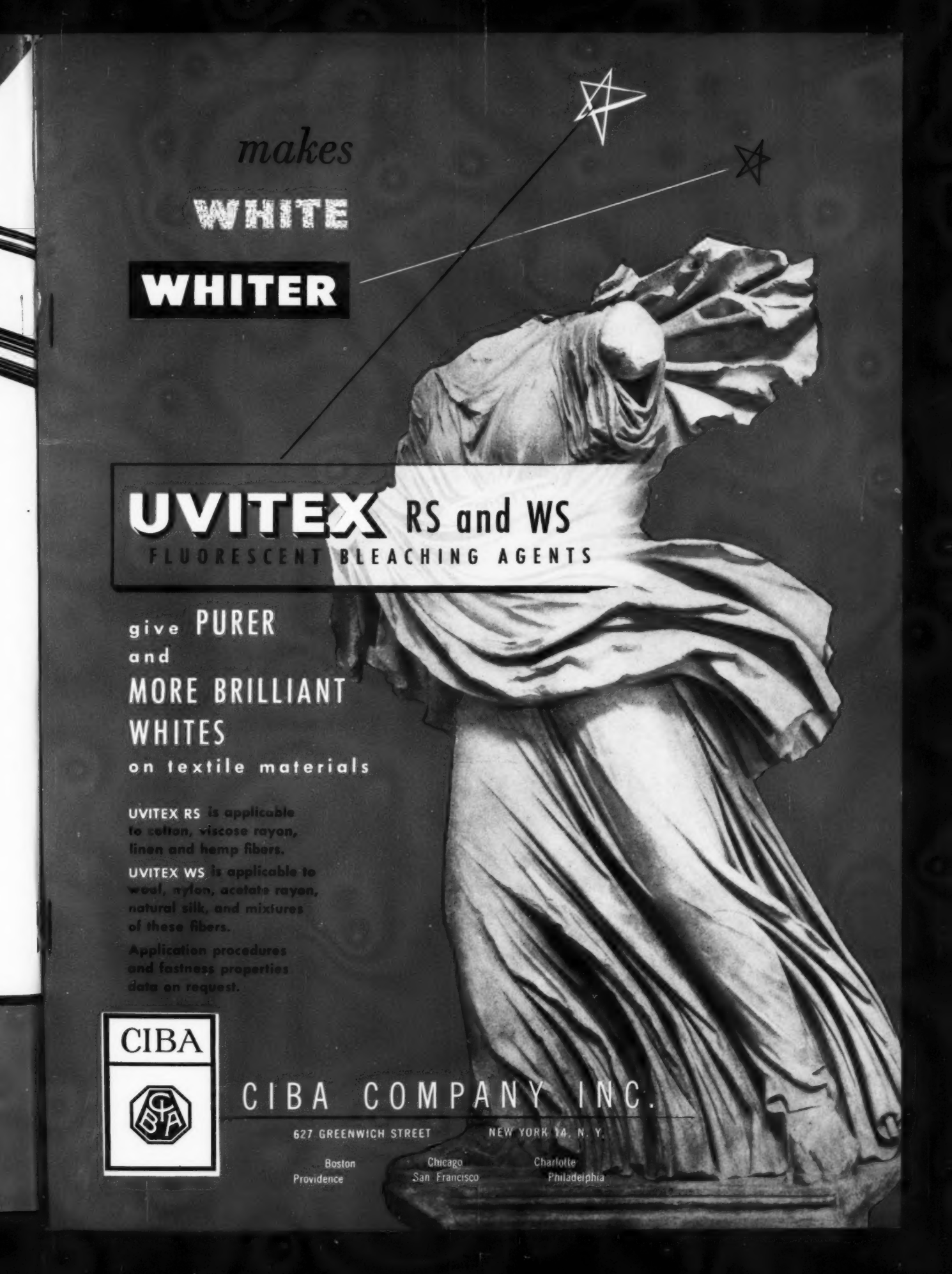
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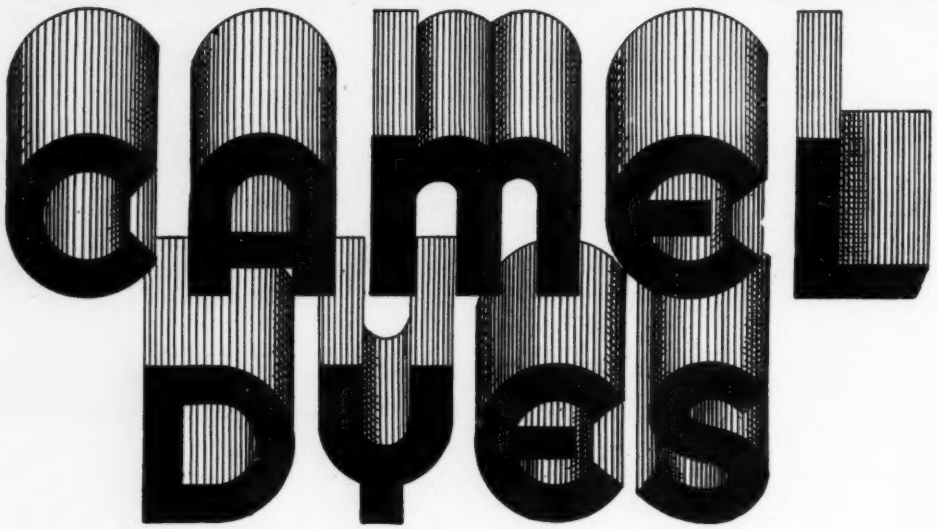

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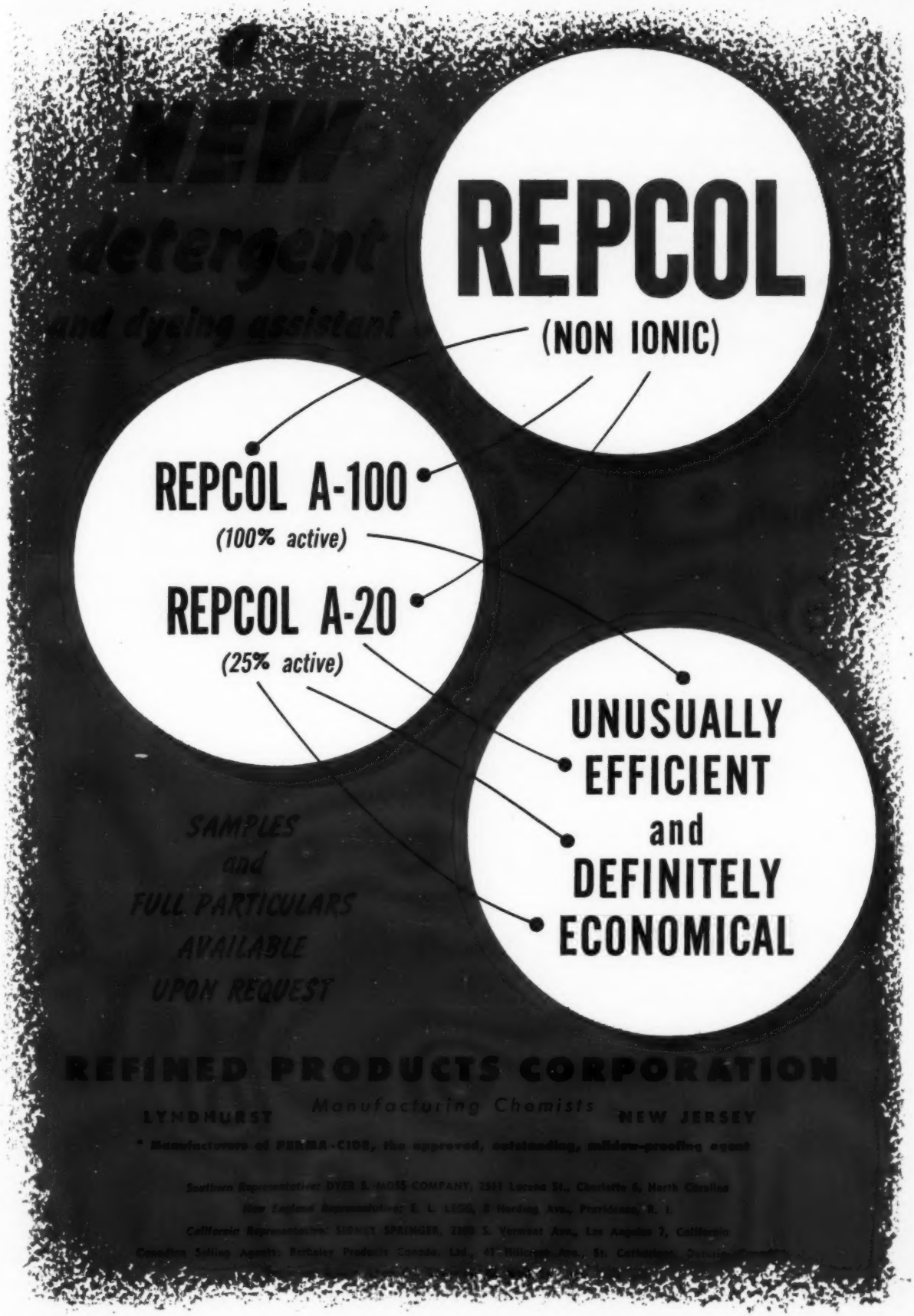
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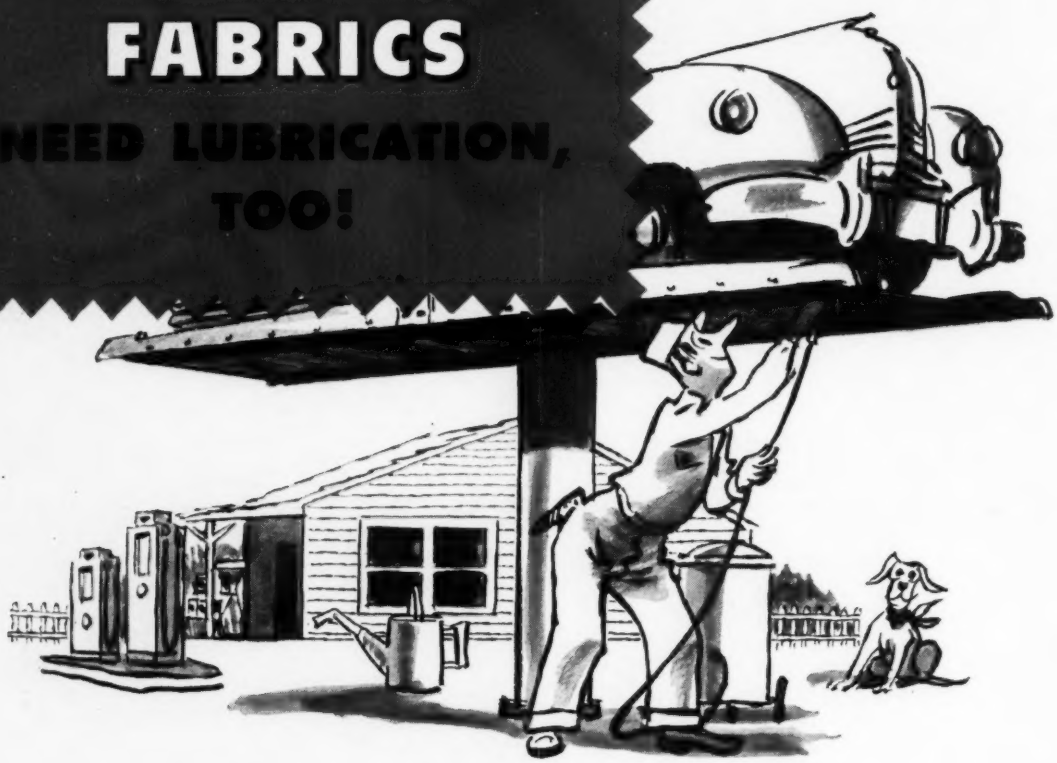

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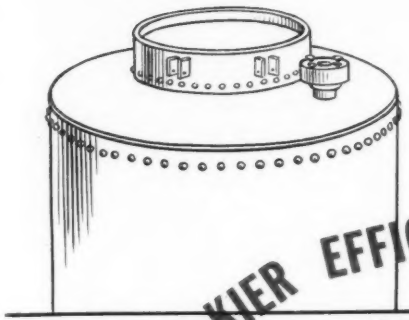

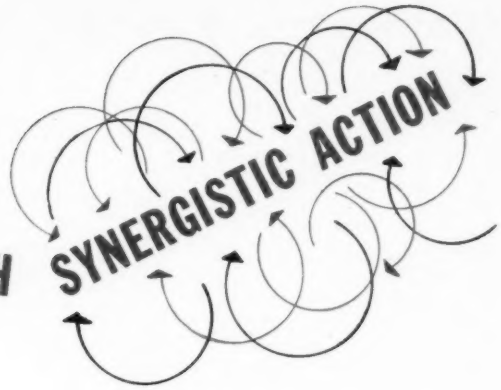

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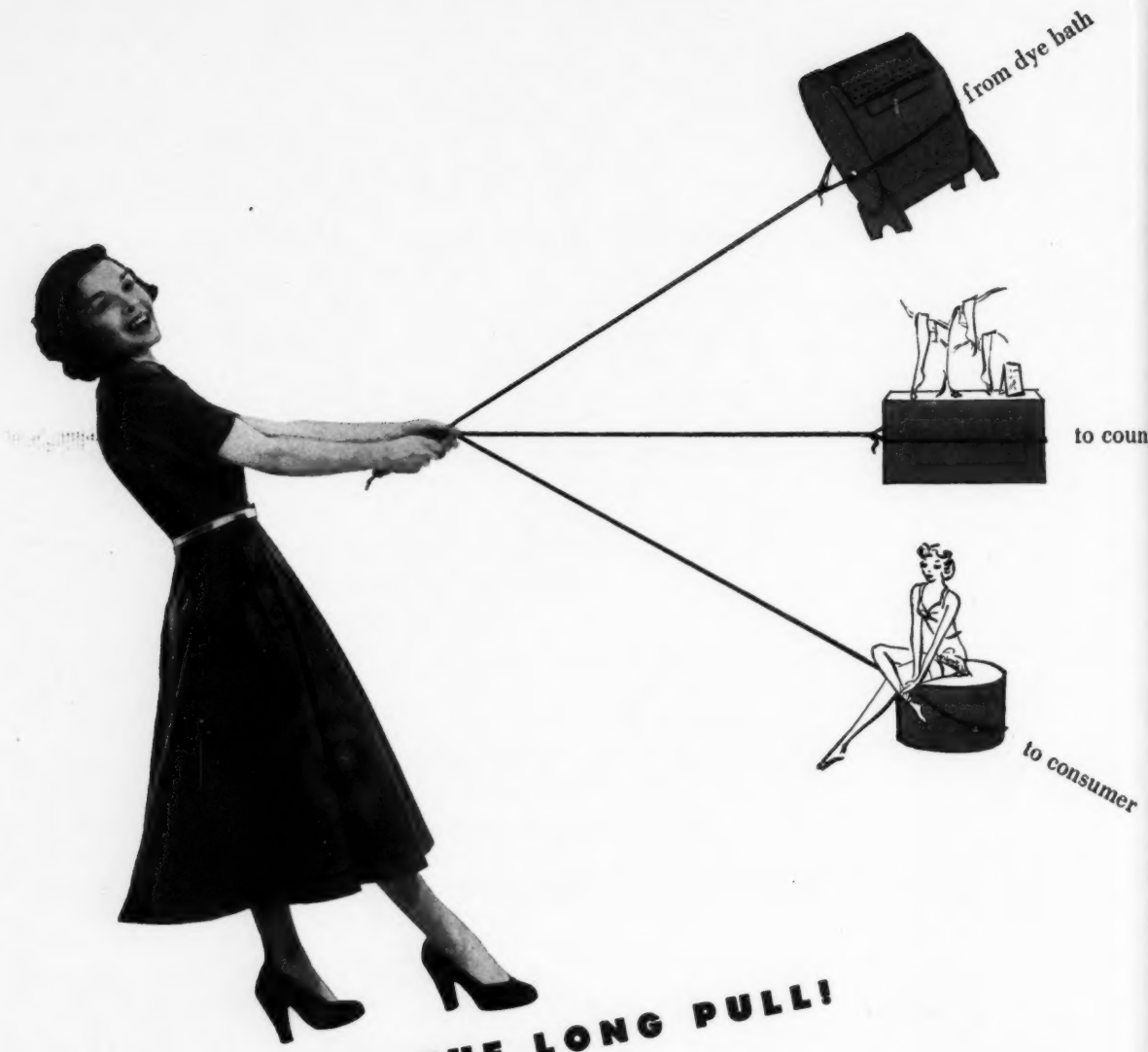

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American Dyestuff Reporter was founded in 1917 and the Textile Colorist and Converter (formerly Textile Colorist) was incorporated with it in January, 1949. Published every other Monday by the **HOWES PUBLISHING COMPANY, INC., One Madison Avenue, New York 10, N. Y. C. R. Howes**, President; **Harry F. Crawford**, Executive Vice-President; **Norman A. Johnson**, Vice-President; **Ernest J. Finan**, Treasurer; **Myron D. Reeser**, Secretary; **C. Essenbreis**, Assistant Secretary.

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APRIL 3, 1950
VOLUME 39 NUMBER 7

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VOLUME 39 APRIL 3, 1950 NUMBER 7

EFFECTIVENESS OF DETERGENTS IN REMOVING SOIL FROM A COTTON AND A WOOL FABRIC

MARGARET S. FURRY and VERDA I. McLENDON

Bureau of Human Nutrition and Home Economics, Agricultural Research Administration, U. S. Department of Agriculture[1]

IN connection with research aimed at improving home laundering methods, the Bureau of Human Nutrition and Home Economics is determining the efficiency of soaps and synthetic detergents in removing soil from fabrics. In the first report *(1)* of that work 15 soaps, 1 soap powder, and 35 synthetic detergents were evaluated for their soil-removing efficiency by measuring the change in light reflectance which the detergents produced in the laundering of an artificially soiled cotton fabric. The test cloth used for the study was prepared in the Bureau's laboratory by immersion in a soiling mixture.

In view of the widespread interest in the effect that the soiled test cloth may have on the laboratory evaluation of detergents, the above study was extended to include two commercially available test fabrics, a cotton and a wool, prepared by printing or padding one side of the material rather than by immersion in a soiling bath. The cotton test fabric was G.D.C. printed soil cloth No. 26 *(2)* and the wool test fabric was a chlorinated cloth printed with a soiling mixture of the same composition as that used on the cotton[2]. This report gives the results obtained with these fabrics.

Experimental Procedure

The detergents selected for this study include 10 of the soaps and 27 of the synthetic detergents that were analyzed previously *(1)*. In Tables I, II, and III they are classified as anionic, cationic, and nonionic, according to their manner of ionization in water solution. The soaps are subdivided into groups depending upon the amount of builder present; the synthetic detergents according to the type of active ingredient which they contain. Household products purchased on the retail market under various trade names

Figure 1. Laundering the test cloth. Each sample is washed separately in a pint jar in the Launder-Ometer.

[1] Grateful acknowledgment is given to Phyllis Putnam for assisting with washing tests and calculating results.

[2] These test fabrics were obtained from Test Fabrics Inc., 224 West 35th Street, New York, New York.

TABLE I

Soil removed (in terms of mean spread) from printed soil cotton fabric at different concentrations of detergent, as received, in distilled water at 40°C.

Type / Detergent	Active ingredient[1]	Mean spread[2] at different concentrations of detergent, as received			
		0.05 Percent	0.15 Percent	0.25 Percent	0.35 Percent
	Percent				
Anionic Detergents:					
Soaps					
Soap 1	92.5	23.9	28.2	28.9	28.8
Soap 2r	96.4	...	26.0	26.2	26.3
Soap 3r	96.2	24.2	26.9	26.4	25.8
Soap 6r	93.2	22.8	27.5	30.1	28.6
Built soap 1r	77.8	22.7	25.2	27.9	27.7
Built soap 5r	68.4	...	20.5	21.8	24.6
Built soap 6r	58.5	...	24.3	28.8	27.5
Built soap 7r	57.3	...	24.1	25.5	26.3
Built soap 8r	54.8	20.3	27.8	29.8	28.7
Salts of alkyl sulfates					
Sodium lauryl sulfate 1	48.6	18.8	25.5	23.4	23.4
Sodium lauryl sulfate 2	46.5	18.1	20.2	21.5	22.2
Sodium lauryl sulfate 3r	38.2	17.9	23.8	23.3	22.8
Sodium lauryl sulfate 4	31.5	20.4	21.3	25.1	23.2
Sodium oleyl sulfate 1	27.2	17.7	20.9	22.2	23.5
Sodium salts of alkyl aryl sulfonates					
Alkyl aryl sulfonate 1	90.8	15.5	20.0	17.5	18.0
Alkyl aryl sulfonate 3	36.4	14.2	17.0	19.2	21.4
Sodium salts of sulfated and sulfonated esters					
Sulfated glyceryl ester 1r	29.6	16.2	18.8	19.7	21.0
Sulfated glyceryl ester 2	26.7	11.1	14.6	17.3	17.9
Sulfonated ethyl ester 1	50.0	20.3	22.4	23.7	24.0
Sodium salts of sulfated and sulfonated amines or amides					
Alkyl amine sulfate 1	12.8[3]	12.8	13.4	15.7	15.3
Fatty acid amide sulfate 1	18.6	13.1	15.5	17.6	18.7
Fatty acid amide sulfate 2	8.9	13.6	13.0	13.9	16.0
Fatty acid amide sulfonate 1	31.9	20.6	22.3	20.7	...
Cationic Detergents:					
Cetyl trimethyl ammonium bromide	98.8	4.9	5.2	5.9	6.2
Alkyl dimethyl benzyl ammonium chloride	21.8	3.8	4.1	4.2	4.5
Diethyl aminoethyl oleyl amide dimethyl sulfate	8.3	4.2	3.8	4.0	3.7
Nonionic Detergents:					
Fatty acid amides					
Fatty acid diethanolamide 1	87.6	20.7	19.6	21.4	22.5
Polyethylene ether condensates					
Polyglycyl ester 1	98.3	14.4	19.9	19.7	18.9
Polyglycyl ether 1	27.6	13.2	19.5	21.6	21.1
Polyglycyl ether 2	27.4	15.6	19.2	20.2	18.8

(1) Reported previously (*1*).
(2) The mean spread is an average of the change in light reflectance for three samples.
(3) Built with 15 percent or more alkaline salts (as Na_2CO_3).

TABLE II

Soil removed (in terms of mean spread) from printed soil wool fabric at different concentrations of detergent, as received, in distilled and hard water at 40°C.

Type / Detergent	Active ingredient[1]	Hardness of water	Mean spread[2] at different concentrations of detergent, as received.			
			0.05 Percent	0.15 Percent	0.25 Percent	0.35 Percent
	Percent					
Anionic Detergents:						
Soaps						
Soap 1	92.5	Distilled	8.1	11.6	13.3	...
		300 p.p.m.	...	6.0	8.4	10.7
Soap 2r	96.4	Distilled	8.8	12.0	13.4	...
		300 p.p.m.	...	6.0	9.1	11.0
Built soap 7r	57.3	Distilled	9.5	12.6	14.2	...
		300 p.p.m.	...	6.7	9.5	11.4
Salts of alkyl sulfates						
Sodium lauryl sulfate 2	46.5	Distilled	8.2	13.7	15.2	...
		300 p.p.m.	...	12.6	13.6	13.9
Solium lauryl sulfate 3r	38.2	Distilled	7.0	11.1	13.1	...
		300 p.p.m.	...	7.3	12.1	13.4
Sodium lauryl sulfate 5r	18.7[3]	Distilled	11.3	13.6	16.5	...
		300 p.p.m.	...	10.9	12.6	19.3
Sodium salt of alkyl aryl sulfonate						
Alkyl aryl sulfonate 5r	31.6	Distilled	8.2	11.4	13.7	...
		300 p.p.m.	...	8.0	12.0	17.3
Sodium salt of sulfated ester						
Sulfated glyceryl ester 1r	29.6	Distilled	8.4	11.8	12.8	...
		300 p.p.m.	...	7.9	8.7	9.8
Sodium salt of sulfonated amide						
Fatty acid amide sulfonate 2r	30.4	Distilled	8.4	11.5	13.0	...
		300 p.p.m.	...	9.0	10.5	11.5
Nonionic Detergents:						
Polyethylene ether condensates						
Polyglycyl ester 4r	12.5[3]	Distilled	11.9	12.8	14.2	...
		300 p.p.m.	...	10.6	13.6	13.7
Polyglycyl ether 2	27.4	Distilled	7.5	10.8	11.0	...
		300 p.p.m.	...	7.6	7.6	8.0

(1) Reported previously (*1*).
(2) The mean spread is an average of the change in light reflectance for three samples.
(3) Built with 15 percent or more alkaline salts (as Na_2CO_3).

are indicated by the letter "r" following the identifying numbers. The industrial synthetic detergents were obtained from the manufacturers. Each detergent carries the same number as in the previous study *(1)*.

The detergents were evaluated by the change in light reflectance which they produced on the soiled fabrics in laundering. The cotton test fabric was cut into samples, 3¾ inches by 4½ inches, and three replicates used for each set of laundering conditions. The light reflectance of each sample was read in three places with a photoelectric reflectometer. Then each sample was washed separately in 100 ml. of detergent solution in distilled water at 40°C. with ten ¼ inch steel balls in a pint jar in the Launder-Ometer for 30 minutes (Figure 1). The sample was removed from the jar, rinsed twice by dipping into distilled water in beakers, and twice for two minutes each time in 100 ml. of distilled water in the Launder-Ometer. All rinse water was kept at 40°C. Finally each sample was spread flat on a glass plate and when air dry, the light reflectance was again read in the same three places as before. For the reading, each sample was backed by the other two samples similarly laundered in order to minimize the effect of background on light reflectance.

In general, the experimental procedure for laundering the wool test fabric followed that used for the cotton. However, with the wool cloth steel balls were not used in either the washes or the rinses, the washing time was 10 minutes instead of 30 minutes, and light measurements were made with a color difference meter (Figure 2) in place of the reflectometer. Also some of the wool samples were laundered in water of 300 p.p.m. hardness. The concentrations of detergent solutions used for both test fabrics were 0.05, 0.15, 0.25, and 0.35 percent of the detergent as received.

The difference between the light reflectance readings before and after laundering in the detergent solution is a measure of the soil removed and is reported as the "spread" (Table I and Table II). The soap index (Table III) was calculated by dividing the mean spread of the detergent at 0.25 percent concentration and 40°C. in either distilled water or water of 300 p.p.m. hardness by the spread obtained with soap 1, the soap used as the standard, at the same concentration and temperature in distilled water.

Results and Discussion

The amount of soil removed (in terms of the mean spread) on laundering the printed cotton test fabric with different concentrations of various soaps and synthetic detergents in distilled water at 40°C. is given in Table I. The household soaps without builder and some of the built soaps were almost as efficient in removing soil from the cotton test fabric as the standard, soap 1. The remaining built soaps, especially in the lower concentrations, tended to be less effective. For most of the soaps without builder, there was no significant increase in washing efficiency as the concentration increased from 0.15 to 0.35 percent. On the other hand, for the built soaps the amount of soil removed was significantly greater at 0.35 than at 0.15 percent concentration.

In general, the synthetic detergents in all concentrations studied removed less soil from the cotton test cloth than did the soaps. For most anionic and nonionic detergents the washing efficiency was greater at 0.15 percent than at 0.05 percent concentration. In some cases there was no further improvement in soil removal beyond the 0.15 percent concentration; in others, the efficiency increased up to 0.25 percent and then remained constant. The cationic detergents were inefficient in removing soil at the different concentrations.

The amount of soil removed on laundering the printed wool test fabric with various soaps and synthetic detergents is reported in Table II. In distilled water (also in water of 300 p.p.m. hardness) the two household soap products, soap 2r and built soap 7r, had about the same soil-removing ability as the standard (soap 1) at all concentrations.

In both distilled and hard water, somewhat more soil was removed from the wool test fabric with one of the two industrial synthetic detergents, sodium lauryl sulfate 2, than with the standard. Also, sodium lauryl sulfate 2 removed more soil than the other industrial detergent, polyglycyl ether 2. The various household synthetic detergents that contain alkaline builders were more effective in distilled water than the standard, whereas the products without alkaline builders removed about as much soil as the standard.

In hard water, in a majority of cases throughout the concentrations studied, both the unbuilt and the built household synthetic detergents were considerably more effective than the standard soap in removing soil from the wool test fabric. The built products were generally more efficient than the unbuilt.

In Table III is reported the soil-removing efficiency of the soaps and synthetic detergents compared with the standard soap, as evaluated with both the cotton fabric and the wool fabric. The results are expressed as soap index values, that is, the efficiency of the detergent in terms of that of the standard soap in distilled water. For the most part, differences in

Figure 2. Measuring the light reflectance of wool test cloth with a photoelectric color difference meter. Before laundering, the light reflectance of each sample is read in three places; after laundering the reflectance of the same three places is read again.

TABLE III

Washing efficiency of detergents at 0.25 percent concentration in distilled and hard water at 40°C.

Type	Detergent: Active ingredient[1]	Soap index at 0.25 percent detergent, as received: Printed soil cotton fabric, Distilled water	Printed soil wool fabric, Distilled water	Printed soil wool fabric, 300 p.p.m. water
Anionic Detergents:	Percent			
Soaps				
Soap 1	92.5	1.00	1.00	.63
Soap 2r	96.4	.91	1.01	.68
Soap 3r	96.2	.91	.95	...
Soap 6r	93.2	1.04	.96	...
Built soap 1r	77.8	.97	.98	...
Built soap 3r	72.3	...	1.06	...
Built soap 5r	68.4	.75	.91	...
Built soap 6r	58.5	1.00	1.02	...
Built soap 7r	57.3	.88	1.07	.71
Built soap 8r	54.8	1.03	1.06	...
Salts of alkyl sulfates				
Sodium lauryl sulfate 1	48.6	.81	...	...
Sodium lauryl sulfate 2	46.5	.74	1.14	1.02
Sodium lauryl sulfate 3r	38.2	.81	.98	.91
Sodium lauryl sulfate 4	31.5	.87	...	...
Sodium lauryl sulfate 5r	18.7[2]	...	1.24	.95
Sodium oleyl sulfate 1	27.2	.77	...	...
Sodium salts of alkyl aryl sulfonates				
Alkyl aryl sulfonate 1	90.8	.61	1.05	...
Alkyl aryl sulfonate 3	36.4	.66	.99	1.05
Alkyl aryl sulfonate 5r	31.6	...	1.03	.90
Sodium salts of sulfated and sulfonated esters				
Sulfated glyceryl ester 1r	29.6	.68	.96	.66
Sulfated glyceryl ester 2	26.7	.60	.92	.65
Sulfonated ethyl ester 1	50.0	.82	1.12	...
Sodium salts of sulfated and sulfonated amines or amides				
Alkyl amine sulfate 1	12.8	.54	1.01	...
Fatty acid amide sulfate 1	18.6	.61	.83	...
Fatty acid amide sulfate 2	8.9	.48	.95	...
Fatty acid amide sulfonate 1	31.9	.72	1.02	.81
Fatty acid amide sulfonate 2r	30.4	...	.98	.79
Cationic Detergents:				
Cetyl trimethyl ammonium bromide	98.8	.20	...	...
Alkyl dimethyl benzyl ammonium chloride	21.8	.15	...	...
Diethyl aminoethyl oleyl amide dimethyl sulfate	8.3	.14	...	...
Nonionic Detergents:				
Polyethylene ether condensates				
Polyglycyl ester 1	98.3	.68	.70	...
Palyglycyl ester 2r	14.1[2]	...	1.10	.93
Polyglycyl ester 4r	12.5[2].	...	1.07	1.02
Polyglycyl ester 6r	...	...	1.11	.96
Polyglycyl ether 1	27.6	.75	...	...
Polyglycyl ether 2	27.4	.70	.83	.57
Water	...	.26	.40	.31

(1) Reported previously (*1*).

(2) Built with 15 percent or more alkaline salts (as Na_2CO_3).

index value of 0.10 and above are significant.

Evaluation of results with both the printed soil cotton and the printed soil wool cloth indicates that the soaps without builder and the built soaps removed about as much soil as the standard soap.

The washing efficiency of the synthetic detergents with the cotton in distilled water was considerably lower than that of the soaps. The anionic and nonionic products removed from 48 to 87 percent as much soil as the standard soap. The salts of alkyl sulfates and one sulfonated ester removed the most soil. Next in order were the nonionic detergents, the fatty acid amide sulfonate, the sulfated glyceryl esters, the alkyl aryl sulfonates, and the sulfated amines and amides. The cationic detergents were the least effective and were only 14 to 20 percent as efficient as the standard.

A comparison of the results obtained previously (*1*) shows that the order of detergents in removing soil from the printed soil cotton cloth and from the immersed soil cotton cloth prepared in the Bureau's laboratory was much the same. However, the differentiation between the synthetic detergents was greater with the immersed than with the printed soil fabric.

With the printed wool fabric, many of the synthetic detergents in distilled water were considerably more effective than the standard soap in removing soil. Most of the remaining products were as efficient as soap. In hard water, eight of the thirteen synthetic products tested removed as much soil as soap 1 in distilled water, but the others were considerably less efficient. Of the household detergents used with the wool fabric, the built products, sodium lauryl sulfate 5r and the polyglycyl esters 2r, 4r, and 6r, had the highest washing efficiency in both distilled and hard water.

Under the conditions used in these tests the soil was removed more readily from the printed wool fabric than from the printed cotton since, in distilled water without a detergent, the index values for the wool laundered without steel balls and for the cotton laundered with steel balls were 0.40 and 0.26, respectively. Also, without detergents, slightly more soil was removed from the wool in hard water than from the cotton in distilled water.

Summary

In this study a printed soil cotton cloth and a printed soil wool cloth were used as test fabrics for evaluating the effectiveness of 10 soaps and 27 synthetic detergents in removing soil under standardized conditions. The change in light reflectance which the detergents produced in the laundering of these fabrics was used as a measure of the soil-removing efficiency. Samples of the test fabrics were washed in the Launder-Ometer at 40°C. in distilled water at 4 different concentrations of the detergents as received. Additional samples of the wool were laundered in water of 300 p.p.m. hardness.

A comparison of the results obtained with the two fabrics shows that the index values for the soaps in distilled water were about the same. For the synthetic detergents the values with the wool were for the most part higher than those with the cotton. In distilled water without a detergent more soil was removed from the wool than from the cotton. Also, the results obtained with the printed soil cotton cloth and the immersed soil cotton used previously are in agreement.

The order of efficiency of the synthetic detergents in removing soil from the printed soil cotton and printed soil wool fabric in distilled water was somewhat different. For example, the alkyl aryl sulfonates were much more effective in removing soil from wool than from cotton, while the unbuilt non-ionic detergents were the least effective with wool but were fairly effective with cotton. The built nonionics were among the most efficient of the detergents tested with wool.

On comparing the efficiency of the detergents in laundering wool in distilled and in hard water, the alkyl sulfates, the alkyl aryl sulfonates and the nonionic detergents were about as efficient in hard as in distilled water. The soaps and the remaining synthetic detergents removed less soil in hard than in distilled water.

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Proceedings of the
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"Advance, Achieve Through Continued Cooperation"

TECHNICAL PROGRAM FOR PORTSMOUTH CONVENTION

THE Technical Program Committee for the Twenty-Ninth Annual Convention of the Association at Portsmouth, New Hampshire, September 28-30, 1950, will meet in New York City on April 13, 1950, to complete the organization of the technical program.

The tentative program is as follows:

GENERAL TECHNICAL MEETING

Thursday Afternoon, September 28, 2:00-5:00 P.M.

Three technical papers of general interest will be presented by invited speakers. The subjects will be of interest and importance to all members concerned with education, textile mill operations, research and development.

GROUP MEETINGS

Friday Morning, September 29, 9:00 A.M.-12:00 Noon.

1. Wool and Worsted.
2. Cotton (including printing, bleaching, etc.)

Saturday Morning, September 30, 9:00 A.M.-12:00 Noon

1. Synthetics (cellulosic, etc.)
2. Testing and Auxiliary Chemicals.

INTERSECTIONAL CONTEST

Friday Afternoon, September 29, 2:00-5:00 P.M.

A chairman will be selected for each group meeting, who will conduct the meeting and stimulate discussion. Each of the meetings will consist of approximately four papers including one or more papers by invitation on subjects of general interest to the group. An invitation is extended to all members and to others engaged in technical activities in the group classifications stated to contribute papers for presentation. Instructions for contributed papers are presented for your information.

The titles of the group meetings are self-explanatory, but the following information may be of interest:

WOOL AND WORSTED—This group will be concerned with wool and other protein fibers. Various blends of these fibers with synthetics will also be considered. The interests of this group are somewhat parallel with those stated for the cotton and synthetic groups.

COTTON—Cotton will be discussed by this group. Various blends with other fibers will be included. Papers are requested on new and modified procedures involving preparation, blending, bleaching, dyeing, and other aspects of the production of these materials. Information on instrumentation and new or improved machinery (with exhibits, if possible) is desirable.

SYNTHETICS—Nylon, rayon, acetate and other synthetic fibers, together with blends of these various fibers, will be discussed. Papers for presentation are desired on the preparation for dyeing, blending and finishing, fiber properties and fundamentals of dyeing.

TESTING AND AUXILIARY CHEMICALS—This group will consider the development of new products, the more effective use of old products, new applications and methods of evaluation. In addition, new test procedures and equipment, and the evaluation of existing methods will be discussed. Reports are desired on any of these subjects. Information on the correlation of test methods with consumer end use is solicited.

Contributed Papers

The following instructions and regulations have been established governing contributed papers:

1. Anyone desiring to contribute a paper to a Group Meeting should notify W. George Parks, Department of Chemistry, Rhode Island State College, Kingston, Rhode Island, as soon as possible, giving the title of the proposed paper and the group to which it is to be presented. The time required for the presentation should be stated (30-45 minutes).

2. When the number of papers available for each Group Meeting is known, a selection will be made by the Committee, and the contributors will be advised as to whether their papers have been accepted. The program must be completed as soon as possible in order to assure the best possible arrangement of the papers and to provide adequate time for publicity.

3. An abstract of the paper will be required in advance of the program. Contributors will be notified the date on which this abstract is required.

4. All papers must be completed and available for publication in the *American Dyestuff Reporter* prior to the Convention. Earlier submission will be appreciated.

5. Papers must not be primarily of advertising or promotional character. However, the subject matter may consider commercial products, machinery, instruments, or processing procedures of a commercial nature, provided that they are evaluated from a technical viewpoint.

6. The Technical Program Committee must be the final judge as to which papers are to be accepted, but every effort will be made to include all suitable contributions in the program.

Suggestions

Members may have ideas and suggestions on subjects for presentation at the Group Meetings. Suggestions as to subjects and also speakers will be appreciated by the Committee. This information should be sent promptly to W. George Parks.

The Technical Program Committee:

K. H. Barnard, H. Boxser, M. A. Dahlen, F. Dannerth, S. J. Davis, A. W. Etchells, H. E. Hager, V. B. Holland, R. W. Jacoby, A. D. Nute, S. H. Williams, W. George Parks, *Chairman.*

UNIFORMITY OF GRADING OF THE AMERICAN, BRITISH AND GERMAN LIGHT-FASTNESS STANDARDS*

I. H. GODLOVE

General Aniline and Film Corporation

At the request of the A.A.T.C.C. Light-Fastness Committee, the Color Committee has used tristimulus values and the Adams formula to calculate color differences caused by exposure of British, German and American Light Standards to sunlight and Fade-Ometer light. Tristimulus values were obtained automatically with a GAF-Librascope Tristimulus Integrator upon examination of the unexposed and exposed standard dyeings in a GE (Hardy) Recording Spectrophotometer. The results indicated that the behavior of the American (Christison) Light Standards, although not ideal, is far superior to the behavior of the British and German Standards for purposes of grading fastness to light; in other words, the American Light Standards are more uniformly graded.

Introduction

BECAUSE of divergence of opinions between the British and American members of committees dealing with light-fastness determination, the Light-Fastness Committee of the A.A.T.C.C. requested the Color Committee to undertake the measurements and computations reported in the present paper. The Color Committee, Dr. E. I. Stearns, Chairman, entrusted the author, a member of the Committee, with this work because of the availability to him of the GAF-Librascope Tristimulus Integrator *(1)*. This had been shown to be of high speed and precision for the computation of color or color differences from objective measurements with the G.E. Recording Spectrophotometer. The final, most essential result of the present work is to confirm strongly the belief of the American committees that the uniformity of grading of the American standards is greatly superior to those of the European standards, and in some other ways mentioned in the body of this paper. The Tristimulus Integrator is provided with cams cut to determine numerical specifications of color based on the 1931 I.C.I. Standard Observer and Coordinate System, the I.C.I. Standard Illuminant C (representative of average daylight) and the spectral reflection data of the sample being examined. The triple multiplication of factors involving the sample, the light source and the observer's eye and integration between the limits 400 and 700 mμ, is accomplished in the 2½-minute interval in which the spectral reflection curve is being obtained.

In a final step, the tristimulus values X, Y, Z, so obtained, were converted to fading or color difference by means of the "Chromatic Value" formula of E. Q. Adams *(2)* in the form used by Nickerson & Stultz *(3)* to study matches of camouflage-color standards. This formula had been found by the author to be very useful for the calculation, from physical measurements, of small color differences, such as those produced in fastness tests or involved in matches to a standard. The precise objective measurements are thus converted to a measure of what the average eye sees. The Adams' formula, deriving from the Adams' theory of color vision and the Adams' unique way of plotting the tristimulus values, is not perfect in this last step of conversion, especially if it is desired to compare a color difference between two yellows with the difference between two blues. But when differences between two blues of similar spectral character are compared as in the present work, it may be assumed to be quite accurate. Moreover, it is the most convenient to use of the several color-difference formulas *(4)* which have been proposed (including an unpublished one of the author's). The computations of a "Fading Index" (color difference between exposed and original standard) from X, Y, Z required an average of 90 seconds or less per color, when a number were done at one time. Computation was greatly facilitated by the use of tables for the principal conversion step involved in the Adams formula, prepared by Dorothy Nickerson of the U. S. Department of Agriculture Color Laboratory, who kindly presented the author with a copy; also by the use of a table of squares of decimal fractions rounded off conveniently to five figures after the decimal point, this being prepared by the author.

It should be pointed out that these measurements constitute a reversal of the usual procedure in light-fastness tests. It is most usual to determine and state the number of hours of exposure required to produce a specified amount of fading. In the present work we determine and plot the varying amounts of fading produced in specified times. Each method has certain advantages and certain disadvantages. These will not be discussed here, except to state that in the former method the difficulty is to determine, by repeated examinations, when the required amount of fading has been attained. This required amount of color change is frequently called the "acceptable break", or merely the "break". Auxiliary measurements by the author indicated that there is considerable variation in the amount of fading included in the "acceptable break" by various individuals estimating the color change with the unaided eye at different times. Presumably the use, as standards of comparison, of the blue papers supplied by the National Bureau of Standards materially improves this situation, if it does not completely remove the difficulty. On the other hand, the present method of measuring the fadings produced in given times does eliminate the difficulty by expressing the fadings as definite numbers quantitatively determinable with high precision.

Certain additional small fadings were measured for the purpose of gauging our local estimates of the acceptable break, but the results are not reported here except partially in Table IV (precision).

Experiment and Discussion

SAMPLES (OFFICIAL STANDARDS).—The samples submitted to the author by Dr. E. I. Stearns, Chairman of the A.A.T.C.C. Color Committee, were the official American, British, and German light-fastness standards exposed in natural sunlight and in the Fade-Ometer under the direc-

* Report for A.A.T.C.C. Color Committee.

tion of Hugh Christison at the Arlington Mills Division of Wm. Whitman, Inc., Lawrence, Mass. during the first half of 1949. The American standards are frequently called the "Christison Standards".

The number of hours of exposure and the samples examined are indicated in Table I. They are designated L-1, L-2, to L-8 (in American, British, and German sets each). However, Standard L-1 was eliminated from the American set, being stated to be of no interest because too fugitive. Besides the "standard" number of hours indicated in the second row of Table I, exposures were also for the "doubled" number of hours of the third row. Since the doubled hours did not include 320 hours, we have a total of (3 x 8) + (3 x 7) — 2 = 43 standards, each exposed and measured for sunlight and Fade-Ometer. The number of measurements and integrations was double this, or 86, since the "original" or unexposed portion of each sample was examined at the same time as the exposed ("faded") portion. This precaution was taken because there were variations even in the unexposed portions, possibly due to temperature effects. This also minimized day-to-day variations with humidity and temperature in the spectrophotometer and integrator. The number of computations of fading indexes was 43, since this index measures the color difference between a pair of colors "faded" and "unfaded", designated hereafter as "F" and "O" (original).

The standards of America are described, along with official methods of use, in the A.A.T.C.C. *Year Book (5)*. Measurements for twice the "standard" number of hours ("doubled" hours) were also requested by the A.A.T.C.C. Color Committee *(6)*.

MEASUREMENT AND COMPUTATION.—All measurements were made with the (Hardy) G.E. Recording Spectrophotometer *(7)* with freshly prepared magnesium oxide as white standard. Because of possible variations in the oxide, each set was measured with a fresh oxide; and each set was measured in one continuous run to avoid variations due to the spectrophotometer or integrator. Black ports were used in the integrating sphere to eliminate the very small specular component of reflection. Computations of tristimulus values were made automatically by the GAF-Librascope Tristimulus Integrator *(1)* while the spectral reflection curves were being run. The photometric scale of the spectrophotometer was checked at several points, and found accurate to within a tenth of a percent (on a 9%-reflecting sample) in the following way: Six Munsell neutral gray papers A, B, C, D, E, and F, with practically horizontal reflection curves, were selected; and paper A was compared for integrated reflectance (Y-value) with paper F in three ways: (1) F compared directly with A; (2) F compared with A indirectly through B and C, multiplying the reflectance ratio of B to A by the ratio of C to B and by the ratio of F to C; (3) F compared with A similarly through papers D and E. Within the limits mentioned above, the three comparisons of F with A yielded the same result. Since the papers had been so selected in reflectance as to put the measurements on different portions of the photometric scale, this method is believed to give a good check of the whole scale. Daily comparisons of a standard glass, in turn compared with a glass standardized at the National Bureau of Standards, are also made.

CALCULATION OF FADING.—The fading was expressed as a number of units of color change or difference between "O" and "F" (original and exposed) portions of the standard. For this purpose the Adams "Chromatic Value" formula *(2, 3)* was used.

The reason for use of this type of formula is that the ultimate consumer is not directly interested in objective physical measurements such as determinations of the percentage of dye destroyed by light exposure. His interest is in the change in appearance of the dyed cloth on exposure to light; that is, color perception, which is subjective. For this reason, in actual use the samples and standards are directly compared ordinarily by visual observation.

In order to convert from spectrophotometric measurements to what the average eye sees, two general steps are necessary. The first is calculation of tristimulus values (X, Y, Z), which were introduced in the *Introduction* of this paper. A graph of these, reduced to percentages of their total, might be used (along with the Y-value to measure the lightness or darkness aspect of the color change) to measure the fading. This procedure, however, is not as satisfactory a picture, in the sense of what the eye actually sees, as that obtained by use of the Adams method. The invention of the GAF-Librascope Tristimulus Integrator, of great precision and speed in the first step, and its availability to the author, was a reason for his being requested to undertake the present work. The second step of converting the tristimulus values to quantities readily interpreted in terms of visual appearance was accomplished by employing the Adams "Chromatic Value" formula, the most convenient of several in use.

This formula *(2, 3)* is the following:

$$F = 10 \left\{ (0.23Vy)^2 + [\triangle (Vx\text{-}Vy)]^2 + [0.4 \triangle (V_z\text{-}Vy)]^2 \right\}^{\frac{1}{2}}$$

where F is the "Fading Index", and 0.23 and 0.4 are scale factors introduced by Nickerson and Stultz *(3)* to make the measures of the three color attributes agree as well as possible with visual judgments of color matches and color differences. The factor ten was introduced by the author to attain a fading unit of more convenient size. Vx, Vy, and Vz are the Munsell "value" equivalents of the tristimulus values, X, Y, Z, respectively; they are read from the Nickerson table mentioned in the *Introduction*.

Conversion of X, Y, Z to "value" units Vx, Vy, Vz was originally accomplished by Adams by an equation, due to the author *(8)*, expressing Munsell "value" as a function of reflectance, as determined experimentally in the late nineteen-twenties. We have now used instead the Nickerson tables, referred to above, based upon a revision of the data *(9)* and incorporating an adjustment for the light source used. In the internationally standard I.C.I. system, X, Y, and Z are computed so that the standard Illuminant C falls at X = .98041, Y = 1.00000, and X = 1.18103 instead of the center X = Y = Z of the I.C.I. color-mixture (chromaticity) diagram. This is because it is very convenient to make the color of the spectrum of equal energy at all wave lengths fall at the center. Since magnesium oxide approximates a physically neutral surface of equal reflectance (unity) at all wave lengths, if it is illuminated by Illuminant C it will reflect Illuminant C. To put this illuminant at the center, we adjust for its unequal coordinates by multiplication of the corresponding X, Y, Z's by the reciprocals of .98041, 1.00000, and 1.18103, respectively. The Nickerson tables incorporate these multiplications, so that it is now only necessary to read off Vx, Vy, and Vz from the corresponding X, Y, and Z. By means of these tables, the special table of squares already mentioned, and special forms for entering data, computations of Fading Indexes were accomplished in the brief time already mentioned.

RESULTS.—Tables II and III and Figures 1 to 8 summarize the data for the standards of the three nations for both standard and double hours and for both standard sunlight and Fade-Ometer exposures. To obtain convenient numbers the Adams formula was arbitrarily multiplied by ten. The unit of the formula as used by Nickerson and Stultz is equivalent to 0.23 Munsell value unit. Multiplication by ten yields ten times as many units in a given fading, or makes the unit one-tenth the original size.

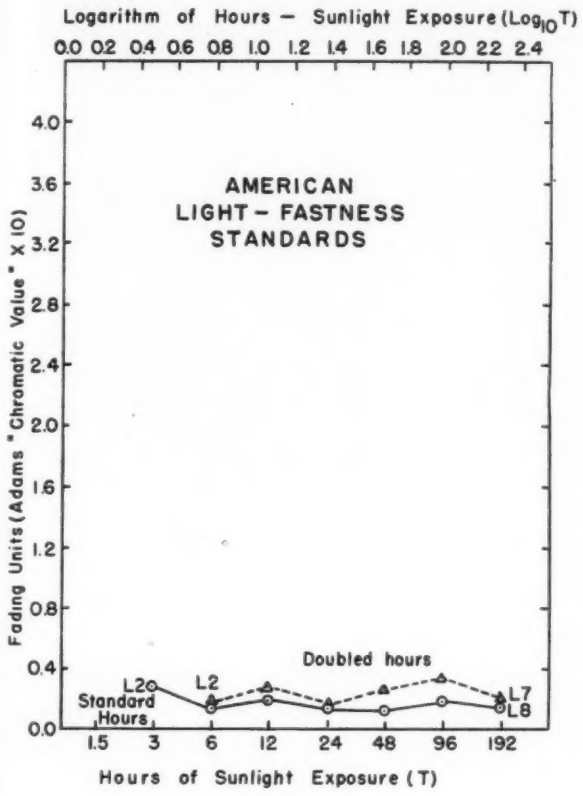

Figure 1

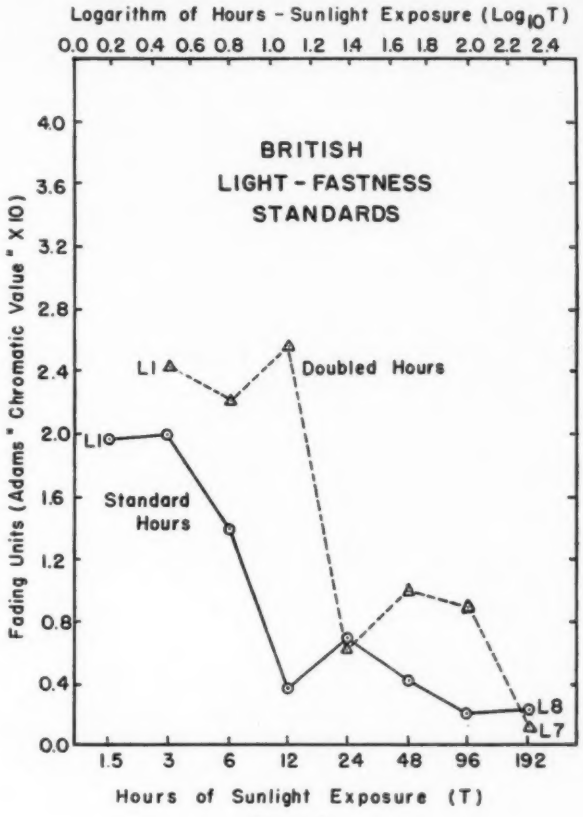

Figure 2

TABLE I

NUMBER OF HOURS OF EXPOSURE

Standard Designation	Sunlight		Fade-Ometer	
	Standard No. of Hours	Doubled No. of Hours	Standard No. of Hours	Doubled No. of Hours
L-1	1½	3	1¾	2½
L-2	3	6	2½	5
L-3	6	12	5	10
L-4	12	24	10	20
L-5	24	48	20	40
L-6	48	96	40	80
L-7	96	192	80	160
L-8	192	...	160	...

TABLE II

SUMMARY OF DATA

FADING INDEXES (Units of Color Change in Sunlight Exposures); AMERICAN, BRITISH, & GERMAN LIGHT-FASTNESS STANDARDS

Standard	Fading Hours	Standard Hours			Fading Hours	Doubled Hours		
		Amer.	Brit.	Germ.		Amer.	Brit.	Germ.
L-1	1½	...	1.95	1.45	3	...	2.4	1.9
L-2	3	0.3	2.0	1.0	6	0.2	2.3	1.85
L-3	6	0.15	1.4	0.8	12	0.3	2.55	1.5
L-4	12	0.2	0.4	0.3	24	0.15	0.6	0.3
L-5	24	0.15	0.7	0.45	48	0.3	1.0	0.9
L-6	48	0.1	0.4	1.0	96	0.35	0.9	0.85
L-7	96	0.2	0.2	0.55	192	0.2	0.1	0.45
L-8	192	0.15	0.2	0.1	...	..	..	...
Average		0.18	0.91	0.71		0.25	1.41	1.11

Mean Deviations from Average of Set

Amer.	Brit.	Germ.	Amer.	Brit.	Germ.
0.05	0.66	0.36	0.07	0.87	0.55

Turning to sunlight exposure first (surely the most significant data since the desire is to make Fade-Ometer fadings approximate sunlight fadings as closely as possible, but in less time), the greater uniformity of the American set over the British and German sets is evident at a glance in Figures 1-3 and confirmed by the data of Table II. The average of the deviations of each fading index from the average of its set is given at the bottom of the table. Similar results are obtained by comparison of the largest and smallest (extreme) fadings. For standard number of specified hours these differences were as follows:

American ..... 0.3-0.1=0.20
British ..... 2.0-0.2=1.80
German ..... 1.45-0.1=1.35

For doubled number of hours, the corresponding numbers were 0.20, 2.45, and 1.60.

The corresponding data for Fade-Ometer exposures are given in Table III and Figures 4-6. Here the preponderance of uniformity in favor of the American set is not so great as in the sunlight exposures, but still considerable; the average deviations indicate almost a twofold preponderance. Again, we have similar results in

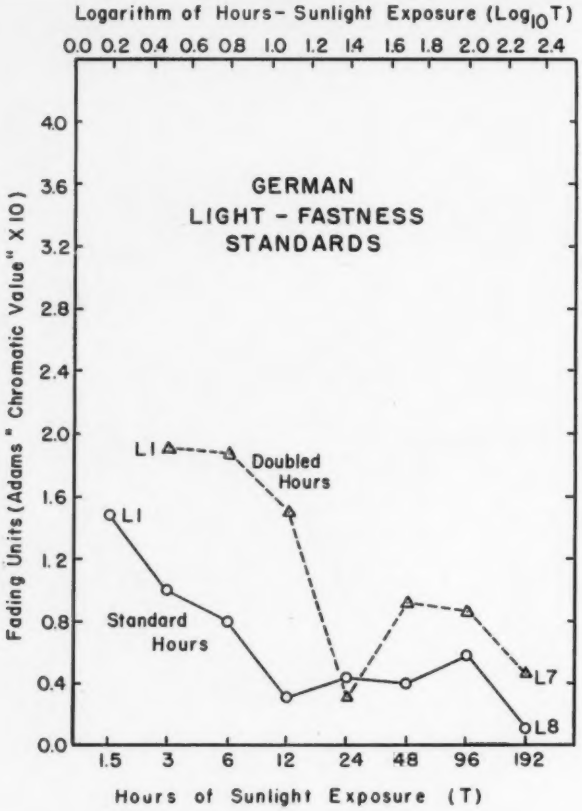
Logarithm of Hours - Sunlight Exposure (Log_{10} T)
0.0 0.2 0.4 0.6 0.8 1.0 1.2 1.4 1.6 1.8 2.0 2.2 2.4
GERMAN
LIGHT - FASTNESS
STANDARDS
Fading Units (Adams " Chromatic Value" X 10)
4.0 3.6 3.2 2.8 2.4 2.0 1.6 1.2 0.8 0.4 0.0
L1
Doubled Hours
L1
Standard Hours
L7
L8
1.5 3 6 12 24 48 96 192
Hours of Sunlight Exposure (T)

Figure 3

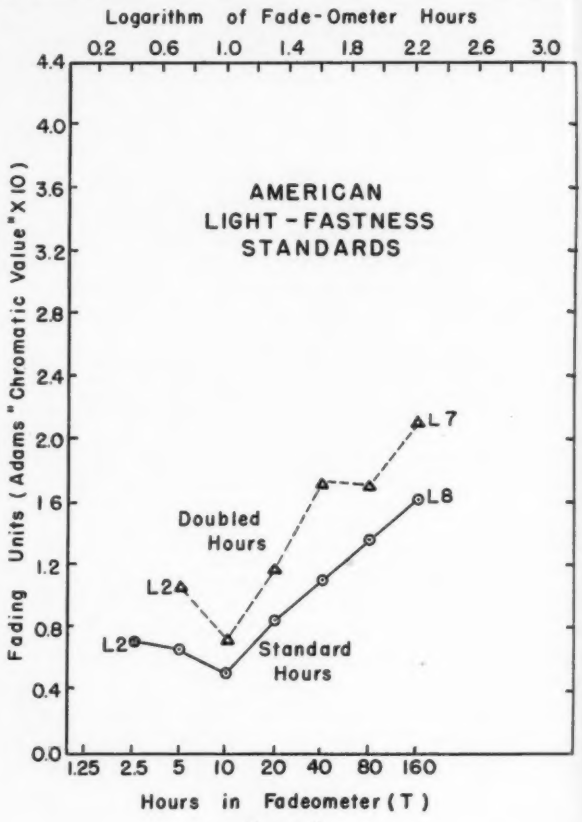

Figure 4

the extreme fadings (standard number of hours):

American	1.6-0.5=1.1
British	3.8-0.7=3.1
German	3.3-0.7=2.6

The corresponding figures for doubled hours are 1.4, 2.9, and 3.5.

Discussion

In addition to the superior uniformity of the American standards, a few other points may be noted: (1) The American set as a whole is much faster that the British and German; (2) in sunlight exposures, British and German standards L-1 to L-3 are much more fugitive than L-7 and L-8; this is not the case in Fade-Ometer exposures; (3) British and German standards L-4 are very badly out of line in Fade-Ometer exposures, and somewhat so in sunlight exposures; (4) as judged by Fade-Ometer exposures, American standards L-5 ot L-8 should be less fugitive to bring them better into line.

RATIO OF MAGNITUDES OF FADE-OMETER TO SUNLIGHT FADING.—A study of this ratio for each given standard is interesting. Since the Fading Indexes are composite total color changes (in all three attributes of the color) they may be directly compared as pure numbers. The average ratio of the magnitudes of Fade-Ometer fading to those of sunlight fading (in the same times) for all fadings is 7.38, varying only from 6.45 for the German to 8.23 for the British standards; for the American, 7.47. But for particular British standards, the ratio varies from 1.2 for L-1—1¼ hrs. to 47.6 for L-7—160 hours, and nearly as badly for the German standards. In the American set, the variation is more reasonable (2.9 to 11.9). It may be noted also that the ratio is very much higher for all standards L-5 to L-8 than for L-1 to L-4.

CHANGES IN SHADE (HUE).—Besides the superiorities of the American standards mentioned in the last four paragraphs, it may be observed visually that they fade with less change in hue than the European standards. The latter standards do not behave uniformly with re-

TABLE III

SUMMARY OF DATA

FADING INDEXES (Units of Color Change in Fade-Ometer Exposures); AMERICAN, BRITISH, and GERMAN LIGHT-FASTNESS STANDARDS

	Fading	*Standard Hours*			*Fading*	*Doubled Hours*		
Standard	*Hours*	*Amer.*	*Brit.*	*Germ.*	*Hours*	*Amer.*	*Brit.*	*Germ.*
L-1	1¼	..	1.94	1.76	2½	..	3.28	2.80
L-2	2½	0.70	2.81	3.34	5	1.06	3.70	3.75
L-3	5	0.65	3.35	3.19	10	0.72	2.86	3.70
L-4	10	0.50	0.70	0.73	20	1.17	1.76	1.22
L-5	20	0.84	2.94	2.14	40	1.72	4.67	4.66
L-6	40	1.10	2.22	2.54	80	1.70	3.61	4.05
L-7	80	1.36	2.74	2.03	160	2.10	3.55	2.92
L-8	160	1.61	3.85	2.92	...	...	...	...
Average		0.96	2.55	2.30		1.40	3.37	3.30
		Mean Deviations from Average of Set						
		Amer.	*Brit.*	*Germ.*		*Amer.*	*Brit.*	*Germ.*
		0.35	0.72	0.64		0.43	0.60	0.83

TABLE IV
PRECISION

UNITS OF COLOR CHANGE (FADING-INDEX CHANGES); REPEAT MEASUREMENTS ON LIGHT-FASTNESS STANDARDS

Standard	Fading Hours	American Repeats		American Differences	British Repeats		British Differences	German Repeats		German Differences
Fade-Ometer										
L-1	1¼				2.04	1.85	0.19	1.73	1.79	0.06
L-1	2½							2.80	2.80	0.00
L-2	5	1.21	0.92	0.29						
L-3	1¼	0.39	0.16	0.23						
L-3	2½	0.43	0.36	0.07						
L-3	5	0.63	0.67	0.04						
L-3	10	0.69	0.75	0.06						
L-4	10	0.51	0.49	0.02	0.70	0.70	0.00	0.77	0.69	0.08
L-4	20	1.26	1.08	0.18	1.73	1.78	0.05	1.22	1.23	0.01
L-5	20				2.90	2.98	0.08	2.10	2.19	0.09
L-5	40				4.67	4.67	0.00	4.53	4.78	0.25
L-6	5	0.35	0.24	0.11				0.38	0.53	0.15
L-6	10	0.33	0.12	0.21						
L-6	20	0.62	0.49	0.13						
L-6	40	1.10	1.02	0.08	2.20	2.24	0.04	2.44	2.40	0.04
L-6	80	1.70	1.50	0.20				4.05	4.04	0.01
Sunlight										
L-6	48	0.12	0.13	0.01				0.40	0.41	0.01
L-6	96	0.34	0.26	0.08				0.85	0.90	0.05
Averages				0.12			0.06			0.07

General Average Differences (Reproducibility) 0.09

spect to change of hue as they fade. This effect was studied by the author in detail only by means of measurements on American and German standards L-6, where, perhaps, the difference is most noticeable. The course of fading is exhibited in Figure 7 with respect to total magnitude (Fading Index) only. In Figure 8, the chromaticity (hue and saturation) changes are shown on an I.C.I. diagram.

Turning to the latter figure first, we see that in a rough general sense the fadings of L-6 in sunlight and Fade-Ometer are from blue toward greenish gray; that is, toward the gray ("white") point represented by average daylight, more exactly toward the grayish greens designated 7.5 G 3/2 and 1.0 G 3/2 in the Munsell color system. The start is roughly from the more saturated (brighter) colors 10 B 3/7 (German) and 2.5 PB 3/6 (American). More exactly, the magnitudes of the hue changes, in Munsell hue steps, were as follows:

	In Sunlight	*In Fade-Ometer*
American L-6	0.0	5.5
German L-6	1.0	21.5

The fading in the narrowest sense, that of becoming lighter, was very little in all cases, reaching as high as 0.35 Munsell value step only in the case of the German standard in the Fade-Ometer; in other cases it was less. The saturation losses (dulling or decrease in Munsell chroma) were as follows:

	In Sunlight	*In Fade-Ometer*
American L-6	0.4	2.2
German L-6	1.1	4.3

The only notable point about the composite or total fading, expressed in terms

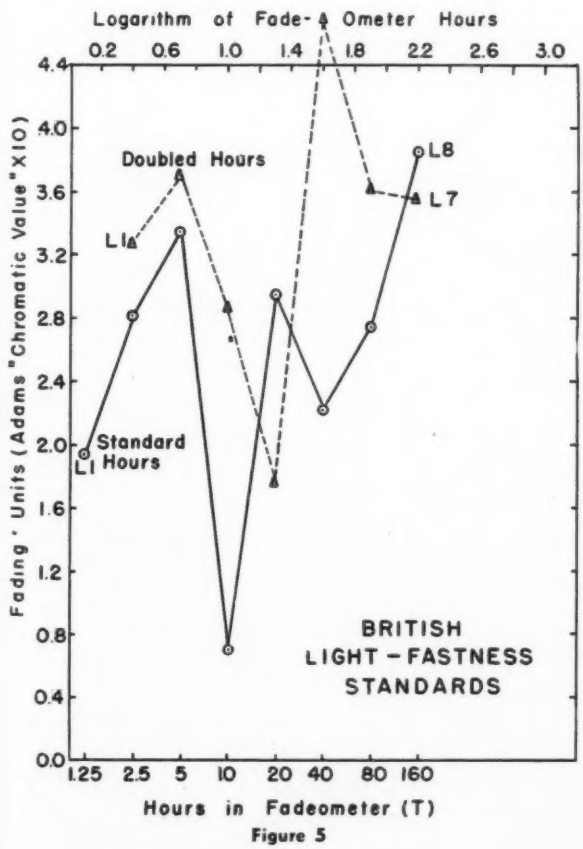

Figure 5

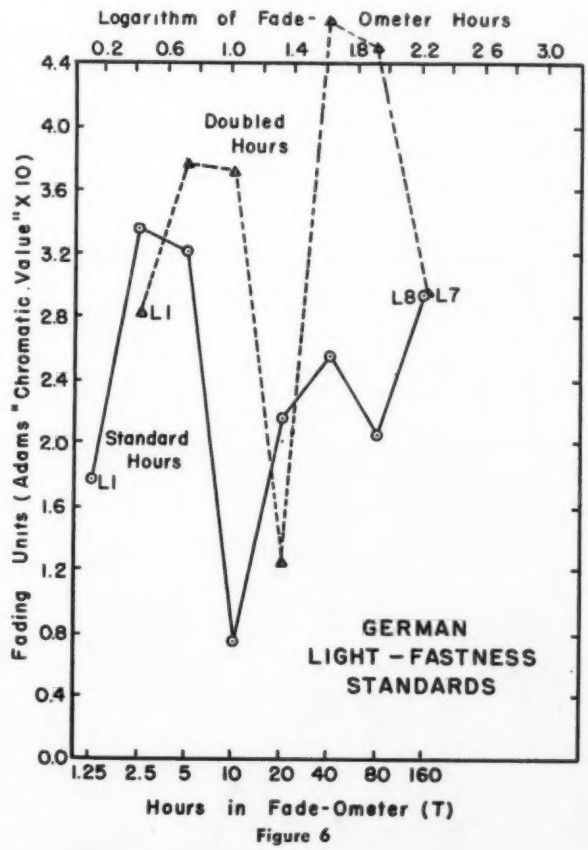

Figure 6

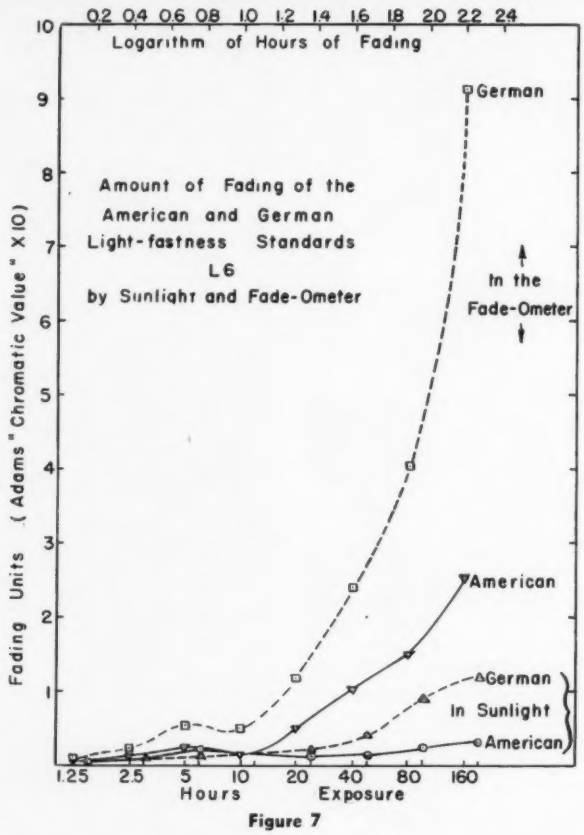

Figure 7

of the Fading Indexes in Figure 7, is the reversal at 10 or 12 hours compared with 5 or 6 hours. The slightly smaller fading at greater time can be seen, we believe, by careful scrutiny. Further, we do not believe any appreciable error in the overall spectrophotometry, integration and computation of Fading Indexes very likely, both because of the good reproducibility (reported below); and because each set was measured as a unit at one time (American in Sunlight, etc.), and the reversal is shown in all four sets.

Another surprising and interesting fact was that the unexposed originals, supposed to be identical, varied in tristimulus values by 2 to 5 percent in the four sets, an error considerably greater than our error of measurement (over-all reproducibility better than 0.1 unit in Fading Index). The variation was greatest for the German standard in the Fade-Ometer, but not much greater than for the same set in sunlight. It was therefore probably not a simple temperature effect.

PRECISION OR REPRODUCIBILITY.—The precision of the G.E. Recording Spectrophotometer is fairly well known; and that of the Tristimulus Integrator is discussed in bibliographical Reference 1. We therefore give in Table IV the over-all day-to-day reproducibility of our final computed Fading Indexes from 31 repeats of spectrophotometric measurements, these being, incidentally, of more direct interest in the present work. The final result was 0.09 of our unit. In other work, done since the light-fastness work in part for another A.A.T.C.C. Committee, the reproducibility was 0.06-0.03 units.

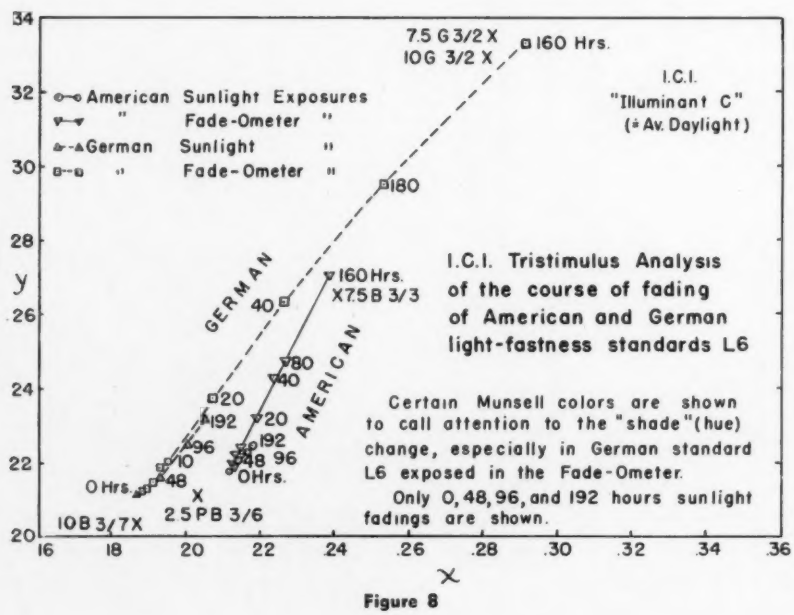
7.5 G 3/2 X
10 G 3/2 X
160 Hrs.
I.C.I. "Illuminant C" (≈ Av. Daylight)
American Sunlight Exposures
" Fade-Ometer "
German Sunlight "
" Fade-Ometer "
180
160 Hrs.
X 7.5 B 3/3
GERMAN
AMERICAN
I.C.I. Tristimulus Analysis of the course of fading of American and German light-fastness standards L6
Certain Munsell colors are shown to call attention to the "shade" (hue) change, especially in German standard L6 exposed in the Fade-Ometer.
Only 0, 48, 96, and 192 hours sunlight fadings are shown.
0 Hrs.
0 Hrs.
10 B 3/7 X
2.5 PB 3/6
y
x

Figure 8

Summary

At the instigation of the A.A.T.C.C. Light-fastness Committee and specific request of the A.A.T.C.C. Color Committee, the author has examined the American, British, and German light-fastness standards exposed to sunlight and in the Fade-Ometer. Changes of color (fadings), measured spectrophotometrically and expressed in terms of quantitative units of fading (Fading Indexes), in specified times, have been used to investigate the uniformity of grading of the three national sets of standards.

The American light-fastness standards, whether in the standard number of hours or in double this exposure-time, were found definitely very much more uniformly or evenly graded than the British or German standards, especially in sunlight exposure. This confirms the beliefs from visual estimates of certain American committee members active in this field, as opposed to British views.

The smallest color-difference (Fading-Index) measured was 0.09 units, the largest 4.67 units. The over-all precision (day-to-day reproducibility in 31 repeats) was 0.09 units.

For the standard number of hours, extreme fadings in a given national set were as follows in sunlight: American,

0.1 to 0.3, range 0.2 units; British, 0.2 to 2.0, range 1.8 units; German, 0.1 to 1.45 units, range 1.35 units. Corresponding ranges in Fade-Ometer exposures were 1.1, 3.1, and 2.6 units, respectively. Similar differences in favor of the American standards were found in doubled hours. Mean deviations from the averages of each national set were strongly in favor of the American over the European standards, especially in sunlight exposures; and they are given at the bottom of Tables II and III. It must be remembered here that American standard L-1, said to be very fugitive, was not examined.

In the British and German scales the standard L-4 should be made more fugitive to bring it into line, and the two or three most fugitive American standards might be made less so. The American set as a whole is much faster to sunlight than the European standards. The British standards L-1 to L-5 are relatively more fugitive than the British L-6 to L-8; the German L-1 to L-3 and L-6 are relatively more fugitive than German L-4, L-5, L-7, and L-8.

The GAF-Librascope Tristimulus Integrator and the G.E. Recording Spectrophotometer, together with the tables and forms arranged to facilitate computation by means of the Adams Chromatic Value formula, make the method of measuring amounts of fading used herein rapid and precise enough to be an economically feasible and practical procedure for measuring fading simultaneously in visual and objective terms. The present work shows that this general method may be, and to some extent has been, profitably extended to many problems of the dyestuff and textile industries.

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5. See 1947-48 Year Book of the American Association of Textile Chemists and Colorists, Vol. *XXIV*, pp. 84-5, 113-4 (1948).

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7. A. C. Hardy, J. Opt. Soc. Amer. *25*, 305 (1935)

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Southeastern Section Hears Ravich

DR. LEONARD RAVICH, who had previously spoken on the subject of Photochemical dyeing before the New York Section in January, addressed the Southeastern Section February 25th on the same subject. The meeting was held at Talladega, Alabama. There were about 100 members and guests in attendance.

A banquet followed at the Purefoy Hotel.

Dr. Leonard Ravich Presenting His Paper Before the Southeastern Section

John C. Robertson of Wallerstein Co. and Dr. Ravich Talk Things Over

Mid-West Section Winter Meeting

THE winter meeting of the Mid-West Section was held at the Bismarck Hotel, Chicago, Illinois, on February 18, 1950.

An executive committee meeting of the officers, sectional committee and committee chairmen was called to order at which plans were formulated for the remaining meetings for the year and the annual outing. General policies were discussed. A motion was approved that the Treasurer purchase a one thousand dollar government saving bond and deposit five hundred dollars in the First Federal Savings and Loan Association.

Approximately 115 members and guests attended the afternoon meeting. C. H. A. Schmitt of Sandoz Chemical Works, Inc., presented a colored sound moving picture entitled "Cuprofix, The Modern Aid to Improved Color Fastness for Cotton and Rayon." Following this Mr. Schmitt answered several questions concerning the film and its subject and also displayed various fabrics which had been illustrated in the film.

Dinner was served to 123 members and guests after which the secretary's and treasurer's reports were read and accepted. The chairman of the outing committee, J. G. Stott, reported on the progress his committee had made. F. E. Hilger then reported on the recent national council meeting which he had attended.

After a few other announcements, A. T. Brainerd presented the speaker of the evening, R. W. Jacoby, manager of the Providence Office of the Ciba Company, who spoke on "Current Developments in Textile Processing." Mr. Jacoby augmented his talk with a display of numerous sample dyeings.

Respectfully submitted,

JOHN E. A. SCHRODER, *Secretary*.

Awaiting the Dinner Signal at Southeastern Section Meeting: (L. to R.)—Dr. James Taylor, Professor of Textile Chemistry at Georgia Tech; A. Kempton Haynes, of Rohm and Haas; S. Jack Davis who presided at the meeting; Mrs. Davis; Dr. Leonard E. Ravich, Speaker; and Harman A. Dickert, also of Georgia Tech.

REPORT OF A.A.T.C.C. DELEGATES TO THE I.S.C.C.*

E. I. STEARNS
Chairman

ONE of the current color activities of the A.A.T.C.C. is the preparation of tentative standard spectrophotometric methods for testing dyestuffs. Some work has been done with regard to the form in which these data should be presented and some forms for collecting the data have been prepared. The National Bureau of Standards has agreed to cooperate with the A.A.T.C.C. in this undertaking. The present, tentative plan is for the Bureau to receive the data from cooperating laboratories, organize them, and pass them on to the A.A.T.C.C. committee for action without disclosing the source of specific information. Thus, commercial laboratories will be able to participate and receive the benefit of the work without telling their competitors how they carry out the tests or what their spectrophotometric measurements show on particular products.

Another current activity is a comparative study of the relative merits of the several color-measuring instruments now on the market. It was decided to prepare four sets of three dyeings, making a total of twelve pieces of cloth, for submission to users of the various color-measuring instruments with the request that each piece be measured in four spots. The average of the measurement of the four spots will be taken so as to eliminate, as nearly as possible, sample-mounting errors. Two sets of dyeings are of the type that is difficult for an instrument to evaluate as sensitively as the eye. One of these is a taupe shade in which the concentration of red dye varies very slightly; the other is a black with a slight change in hue. Two of the sets are of the type that a colorimeter can easily evaluate more accurately than the eye. One of these is a yellow with a strength change; the other is a blue with a change in dullness. These four sets will be prepared on wool piece goods. The purpose of these measurements is to compare the sensitivity of the instruments with the sensitivity of the eye. The shade differences in each set will be of the order of magnitude of the limit of the sensitivity of the eye.

The A.A.T.C.C. has also measured instrumentally the light-fastness standards of the German, British and American Textile Societies and has expressed in numerical terms the color differences in the faded and unfaded standard fabrics. These data were obtained with the GAF-Librascope Integrator through the kindness of Dr. I. H. Godlove. They showed that the color differences introduced by fading of the American standards were fairly constant for all the standards of different degrees of fastness, whereas the color differences, or *breaks,* of the German and British standards showed wide discrepancies. Dr. Godlove presents the details in an article on page P215 of this issue.

* Presented before Inter-Society Color Council at Hotel Statler, New York, March 8, 1950.

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Note

THE Swiss Association for Testing Materials has informed the American Association of Textile Chemists and Colorists that it is ready to make arrangements for manufacture of a Crockmeter copied from the American model, credit for which is duly given in the Swiss test for rubbing fastness.

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Pacific Southwest Section to Meet in L. A.

THE Pacific Southwest Section will meet on April 28th at the Los Angeles Athletic Club. Dinner is slated for 6 P.M.

The speaker for the evening will be H. C. Borghetty of General Dyestuff Corporation, New York, N. Y. His topic will be "Preparation and Finishing of Textile Materials".

CALENDAR

COUNCIL
Meetings: April 14 (New York) June 9 (Montreal, Que.) Sept. 28-30 (Portsmouth, N. H. Convention) Nov. 17 (New York).

NATIONAL CONVENTIONS
1950: September 28 to 30, Portsmouth, N. H.
1951: October 18 to 20, Statler, New York
1952: Boston.

LOWELL TEXTILE INSTITUTE STUDENT CHAPTER
Banquet: April 21 (at the Institute).

MID-WEST SECTION
Meeting: May 6 (Schroeder Hotel, Milwaukee, Wisc.), June 17—Annual Outing—Lake Lawn Lodge, Delavan, Wisc., October 28—Chicago, Ill.

NEW YORK SECTION
Meetings: April 14, May 5 Kohler's Swiss Chalet, Rochelle Park, N. J.), June 16—Outing.

NORTHERN NEW ENGLAND SECTION
Banquet: April 21 (Lowell Textile Institute).

PACIFIC SOUTHWEST SECTION
Meeting: April 28 (Los Angeles Athletic Club).

PHILADELPHIA SECTION
Meetings: May 5 (Kugler's, Philadelphia), June 9 (Annual Outing, Torresdale-Frankford Country Club, Philadelphia), October 13, December 8, January 17, 1951.

PHILADELPHIA TEXTILE INSTITUTE STUDENT CHAPTER
Meetings: April 26 and May 24.

PIEDMONT SECTION
Meetings: June 30-July 1 (Ocean Forest Hotel, Myrtle Beach, S. C.), October 28 (Charlotte, N. C.)

RESEARCH COMMITTEE
Meetings: April 14 (New York) June 9 (Montreal, Que.) Sept. (Portsmouth, N. H., Convention) Nov. 17 (New York).

RHODE ISLAND SECTION
Meetings: April 28 (Providence Engineering Society Hall) May 26 (Johnson's Commodore Room, Providence, R. I.) October 27 (Providence Engineering Society Hall) November 17 (Johnson's Commodore Room).

SOUTH CENTRAL SECTION
Meetings: May 20 (Hotel Patten, Chattanooga, Tenn.) August 18-19 (Summer Outing—Read House—Hotel Patten, Chattanooga Country Club—Chattanooga, Tenn.).

SOUTHEASTERN SECTION
Meetings: May 27 (Columbus, Ga.), Sept 23 (LaGrange, Ga.) Dec. 9 (Atlanta, Ga.).

WESTERN NEW ENGLAND SECTION
Meetings: April 14 (Rapp's Restaurant, Shelton, Conn.) May 26 (Waverly Inn, Cheshire, Conn.) June 23 (Outing at Wallingford, Conn. Country Club).

Western New England and Northern New England Sections—

PROBLEMS IN THE DEVELOPMENT OF EFFICIENT WOOLEN-FIBER LUBRICANTS*

PAUL J. MARTIN

Technical Service Department of The Socony-Vacuum Laboratories, A Division of the Socony-Vacuum Oil Company, Incorporated

This paper may conveniently be considered to consist of two parts. The first is a discussion of routine procedures and specialized test methods and apparatus used in the development of wool oils in the laboratory. The latter part sets forth the results of a comprehensive wool-oil evaluation program at the Lowell Textile Institute. These tests, which were primarily a study of self-scouring wool oils, produced significant data on carding, spinning, weaving, and wet finishing. The work at Lowell, utilizing laboratory-control methods on plant-size equipment, gave rise to data practicably unobtainable in commercial mills.

WOOL oil is applied to wool stock to replace the natural wool grease removed from the fibers in the raw-stock scouring operation. The addition of this wool lubricant is necessary to facilitate the passage of the wool through the carding, spinning and weaving operations. Without the addition of this wool oil, fiber breakage, static electricity, etc., would make the wool fibers practically unmanageable in carding.

The presence of a lubricant in spinning is necessary if adequate performance characteristics are to be achieved. The wool oil contributes to a proper *slip-by* of the fibers over one another, reducing fiber breakage, or roving breakage, commonly referred to as *ends down.*

When the wool oil has discharged its functions in carding, spinning and weaving, it must be of such a nature that it is readily removed in a normal washing operation, subsequent to fulling.

A summarization, then, of the factors to be considered in the evaluation of a wool oil would include the following, not necessarily in the order of their importance:

1. Emulsive Properties; Stability of Emulsion.
2. Scourability.
3. Lubricity.
4. Effect on Leather Condenser Tapes and Aprons.
5. Resistance to Discoloration on the Fibers under the Influence of Light.
6. Resistance to Rancidity and Autoxidation.
7. Antistatic Properties.
8. Anticorrosion Properties.
9. Stability to Freezing.
10. Brightness (Clarity) of Wool Oil.

These factors, which must be considered in the development of a wool oil, are obviously many and diverse, and it is the purpose of this paper to outline the progress of development of a wool oil from its embryonic stage in the mind of a chemist in the laboratory to its ultimate use and acceptance in the woolen textile industry.

The typical, self-emulsifiable wool oil today consists of two main components: mineral oil and material or materials known as emulsifiers, which make the mineral oil dispersible in water and which facilitate its removal from the wool fibers in the washing operation.

The mineral-oil components of wool oils generally exhibit a viscosity of approximately 100 Saybolt Universal Seconds at 100°F. However, these 100-second oils vary in the degree of refinement to which they have been subjected. They may be conventionally refined, that is, they may receive a light acid treatment and perhaps a light clay-percolation treatment. An oil of this type, in the main, shows inferior light-stability characteristics. On the other hand, the oil may be heavily acid-treated or solvent-refined, followed by percolation through clay, either of which processes results in an oil of superior light stability.

The emulsifiers in most common use are a blend of mineral oil sulfonates, sulfated fats and soaps of fatty acids or rosin fatty acids. Alcoholic materials, termed coupling agents, may also be present in the formulation.

The mineral oil sulfonates in a wool oil should be highly refined so that they are relatively light in color. Tarry components, naturally present in crude mineral oil sulfonates, would darken the oil and might cause some staining of fibers.

The soaps of fatty acids used in wool-oil formulations should not include semi-drying or drying fatty-acid groups, for those materials tend to oxidize, to become rancid and to cause heating of the wool stock. Examples of semi-drying oils are corn and cottonseed oils; soya and peanut oils are borderline cases, falling between nondrying and semidrying oils; linseed oil, of course, typifies a drying oil. However, saturated fatty acids, like stearic and coconut, with high titers can not be used because they precipitate at freezing temperatures.

Rosin soaps can be used in wool oils only in very small quantities as their tendency to oxidize makes scouring difficult. Furthermore, oxidized rosin may also cause gumming of the cards.

Stabilized rosins, such as hydrogenated, dehydrogenated, or disproportionated rosins, may be used in moderate amounts without impairing the subsequent performance of the wool oil.

Let us suppose that the basic formulation for a wool oil has been determined through several preliminary laboratory screening tests, and that it appears to have sufficient merit to be a commercial product. It then remains for the chemist to ascertain, by means of the extensive, time-consuming laboratory tests discussed in the following paragraphs, the precise combination of materials that can be expected to give optimum performance in actual service.

Laboratory Testing of Wool Oils

EMULSIVE PROPERTIES.—The manufacturing chemist will probably first scrutinize the emulsifiability of the product. Not only must be product emulsify readily with normal agitation in water of hardness as high as 200 ppm over a temperature range of 70 to 130°F. in concentrations of 5% to 25% oil, but it should

* Presented before the Western New England Section on January 27 and before the Northern New England Section on March 24, 1950.

also remain in an emulsifiable state for a prolonged period of time. An acceptable wool oil emulsion of good quality shows no oil separation on the surface of the emulsion and no water settled to the bottom of the emulsion; likewise, little or no *cream* should form on the emulsion. A good wool oil emulsion may be milky-white, or semitransparent to transparent.

SCOURABILITY.—A wool oil that emulsifies readily to form very stable emulsions generally penetrates the stock efficiently and affords good lubricity to wool fibers. However, good emulsion characteristics are no sure criterion that the wool oil will be easily removed in a normal washing operation.

The scourability of an oil, a property of paramount importance to an efficiently run mill, can be determined in the laboratory by two methods: the first is the standard Arthur D. Little scour, and the second is the laboratory fulling and scouring of a woolen fabric. In the Arthur D. Little scour, a fixed quantity of the unemulsified oil is applied from a chloroform solution to wool skeins of a standard weight. The oiled skeins are scoured under controlled conditions in a standard soap solution. Ether extractions of controls representing the unscoured oiled wool skeins and of the scoured oiled wool skeins give the percent of oil removed and the percent of residual oil. Either determination can be used to gauge the scouring ability of the oil.

Laboratory-scale fulling and scouring machines enable the chemist to carry out the second method. In such equipment the wool-oil emulsion can be applied to a scoured or dry-cleaned piece of woolen fabric. The piece is then fulled and washed under controlled conditions. The equipment employed by the writer utilizes a test piece 16 feet long and 16 inches wide. Ether extractions on samples of the test piece before and after fulling and washing permit calculation of the percent residual oil and percent oil removal. The degree of fulling is determined by measurements on the test fabric before and after the fulling operation.

LUBRICITY.—The lubricity imparted to a woolen fiber by a wool oil is obviously also a salient characteristic. However, until recently a convenient satisfactory method for determining the lubricity imparted to a fiber by a wool oil has not been available to the industry. Now a fiber friction meter is available which permits comparatively quick lubricity determinations on single fibers. With this mechanism the coefficient of friction between fibers and reference surfaces, considered a measure of lubricity, can be determined by delicately balancing a single fiber over a cylindrical reference surface and applying weight to the fiber by means of a chain-o-matic weight-loading device; the movement of the individual fiber is observed with the aid of an optical system, and the force required for movement is recorded by suitable electrical devices. From this data the coefficient of friction can be calculated.

It is hoped that further work with this instrument will contribute significantly to our knowledge of the lubrication of textile fibers.

EFFECT ON LEATHER CONDENSER TAPES AND APRONS.—The average life of leather tapes on card condensers is generally considered to be one year on a three-shift schedule under normal operating conditions. And a good wool oil, applied in recommended percentages, should not shorten this service period. Any marked tendency of a wool oil to decrease the service life of leather condenser tapes (also leather aprons) can be determined on a condenser-tape tester. In the machine that the author has employed, commercial condenser tapes are mounted on rolls in an endless belt fashion. The tapes are run continuously on this machine, sometimes for weeks. Twice a day measured amounts of the oil under evaluation are applied to the tapes. The number of hours a tape runs without breaking *cleanly* (breaks at splices and hooks are not considered *clean* breaks) is arbitrarily taken as a measure of the effect of the oil on tape life. It is of interest that the data obtained by this test correlate with tape performance in mills.

RESISTANCE TO DISCOLORATION.—A wool oil may remain on an unfinished fabric through long periods of storage; for this reason a good wool oil should show little or no discoloration during prolonged storage. While discoloration may occur even in the absence of light, the standard test for resistance of a wool oil to discoloration is the Fade-Ometer Test. In this test, 10% of the wool oil to be tested is applied from a solvent solution to a piece of fabric. After drying, the fabric is exposed in the Fade-Ometer for 20 hours. The oil's stability is gauged by visual determination of the discoloration. The best wool oils do not discolor under these conditions.

RESISTANCE TO RANCIDITY AND AUTOXIDATION.—Any tendency on the part of a fiber lubricant to become rancid or to autoxidize upon storage is objectionable. The rancidity characteristics of an oil are determined as follows: A square foot of bleached cotton muslin is impregnated with 5% (anhydrous basis) of the oil to be treated. The muslin is then dried, folded into a three-inch strip, tightly rolled, and placed in a half-pint, glass-top canning jar, to which 5 milliliters of water is added. The jar is sealed and placed in an oven at 200°F. for 50 hours. At the expiration of this time the jar is opened while hot, and odor and discoloration of the test fabric are noted. Fiber lubricants of mineral-oil base generally pass this test.

The Mackey Test is employed to measure the tendency of oiled wool to autoxidize with the attendant danger of spontaneous combustion. Under this test the oil is considered acceptable if the oiled wool does not generate a temperature of over 212°F. in one hour under the conditions specified by the test. All wool oils of the mineral-oil type pass this test.

ANTISTATIC PROPERTIES. — The problems that static electricity poses for wool processors are well known, and it is also recognized that materials can be incorporated in wool oils to aid in controlling the build-up of static potentials. Effective deterrents to trouble arising from static electricity are mineral oil sulfonates, popular emulsifying and detergent materials appearing in the formulations of many of the proprietary wool oils in use today. Comprehensive laboratory studies of antistatic materials and their effect on textile fibers are underway at the present time. In one instrument now used in this investigation a sample of fabric or fibers treated with the oil to be tested is positioned to act as the conductor between two metal plates, across which a predetermined electrical charge is applied. The measure of the antistatic properties of the oil is considered as inversely proportional to the time required for the charge to fall to a fixed arbitrary value. It is felt that data derived from this work will aid the study of the control of static.

ANTICORROSION PROPERTIES. — A wool oil may perform efficiently through the course of a variety of laboratory tests and yet be rejected by the industry if it has a corrosive effect on the metal parts of the card or card clothing.

Corrosion tests in the laboratory consist of immersing weighed strips of various types of metals in the wool oil itself and in emulsions of the wool oil. The strips are periodically examined for evidence of corrosion, and at the expiration of the tests the strips are again weighed and the loss in weight is reported as a measure of the corrosive effects of the oil.

STABILITY TO FREEZING. — Although it is desirable that emulsifiable oils be protected from freezing tempera-

tures, wool-oil suppliers must anticipate that the wool oil may be subjected to low temperatures in storage or in transit during winter months. For this reason wool oils should be compounded so that they are stable, even though they have been exposed to freezing temperatures.

Freeze tests are simple. The wool oil is placed in a refrigerator and held at —10°F. for several hours. The product is then slowly warmed to room temperature. If the oil successfully passes this initial test, that is, shows no separation or gelation, the product is alternately frozen and thawed several more times. If, at the expiration of these tests, the product remains free of separation or gelation, the wool oil is considered to have passed this phase of its development.

BRIGHTNESS.—The appearance of a wool oil, i.e., its clearness or brightness, is not necessarily a measure of its performance as a fiber lubricant. There are wool oils in successful use in the industry that are dim or cloudy in appearance. However, it is generally true that a wool-fiber lubricant lacking brightness will fail to function properly in at least one respect: it will tend to separate into its component parts in storage, or after mixture with water. Thus, an important part of the manufacture of wool oils is the improvement of brightness and clearness. This is accomplished by the addition of small percentages of *adjusting* materials.

MILL-SCALE TESTING OF WOOL OILS.—In the usual scheme of things, when a wool oil has satisfactorily passed the tests described, it would be submitted to an interested mill, so that actual mill performance data can be obtained. This is a valuable procedure and, indeed, most of the wool oils in use today have been proved by this method. However, this approach has one important limitation: the conditions of commercial mill operation vary so much that it is practically impossible to decide which of a group of acceptable products is superior. In an effort to overccome this limitation and yet retain the advantages of mill-scale operation, test work at the Wool Department of the Lowell Textile Institute was sponsored. This procedure, involving as it does the services and plant-scale facilities of a competent and disinterested organization, has indeed produced information which it is believed will be of interest to all users of wool oils.

TESTS AT LOWELL TEXTILE INSTITUTE.—When plans were made for the tests at Lowell, it was felt that the work should be aimed at comparing the performance of the newer types of wool oils concerning which less actual mill performance data are available. These new types are sometimes termed *self-scouring* wool oils. They differ from the older wool lubricants in three respects, all of which stem from the substantially larger quantities of emulsifiers present in the products: (1) they form transparent rather than milky-white emulsions; (2) they are more expensive; and (3) they are removed in scouring with appreciably less soap, a fact that justifies their higher cost in many applications. Thus it was, that when the services of the Wool Department of the Lowell Textile Institute were obtained by means of an industrial grant, it was decided to evaluate two of the sponsor's wool oils and three widely advertised competitive products, all of the self-scouring type. In addition, for purposes of comparison of older type products with the new type, a third product manufactured by the sponsor was included; it is a widely used wool oil of the older type, not generally considered to be in the *self-scouring* classification.

For the purposes of this paper, the three wool oils of the sponsor's manufacture are designated as Products No. 1, No. 2, and No. 3. The other oils, carefully chosen after a scrutiny of quality woolen fiber lubricants available from other leading manufacturers, are referred to as Products A, B, and C.

In the work at Lowell, six thirty-pound lots of wool were taken from the scoured-raw-stock stage through blending, oiling, picking, carding, spinning, weaving and wet finishing. The resultant fabric was then dyed preparatory to dry finishing.

Each lot was oiled with one of the lubricants under test, and each thirty-pound lot was processed under controlled conditions, so that each wool oil functioned, exclusive of the amounts applied, under essentially the same conditions. The percentages of the oils applied were in accordance with the manufacturer's recommendations and with practice in the industry.

The master wool blend had the following composition:

Woolen-Card Soft Waste Medium-Fine Domestic Wool	55.0%
½ Blood Montana & Wyoming Clothing Wool	24.4%
Medium-Fine Short-Staple Wools	20.6%

CARDING.—The master blend was thoroughly mixed in a mixing picker. The individual thirty-pound lots were then oiled with emulsions of the test lubricants. The emulsions were prepared and applied so that approximately 25% of water (based on weight of the wool) was added, together with the following percentages of each of the test oils:

Oil	*Oil Applied* %	*Approximate Ratio of Water to Oil*
Product #1	3	8-1
Product #2	4	6-1
Product #3	5	5-1
Product A	4	6-1
Product B	3	8-1
Product C	4	6-1

The individual oiled lots were run through the mixing picker and allowed to remain in the card room for two hours. The stock was then sent through the card.*

Papers were placed on the floor under the card where the fly waste is heaviest. At the conclusion of each run of seventy-five minutes duration, the fly waste on these papers was collected and weighed. The points of collection were the areas under the following parts of the card:

breast cylinder
first breaker cylinder
intermediate feed
first finisher cylinder

At the expiration of the individual card runs, the following rolls were stripped and the strippings weighed:

first breaker doffer
finisher cylinder
finisher doffer

The card runs proceeded on the following schedule:

1. Card was run 20 minutes before beginning of waste test to get ends up and level off roping weight; time was measured from start to feed into first cylinder feed rolls.
2. Waste papers were placed under card, and waste test was run for 75 minutes.
3. Waste papers were removed and waste was weighed.
4. Card was run until last of the 30 pounds of stock entered the feed rolls of the first cylinder. Spools of good roping were removed and card was run out for 25 minutes.
5. Rolls were stripped and strippings weighed.

* Davis and Furber 60 x 40 3-cylinder set equipped with automatic feed, garnett breast, broadband centerdraw intermediate feed, and 4-bank tape condenser delivering 80 good ends.

TABLE I

Comparison of Fly Loss and Card Strips

Oil	*Applied* %	*Fly Loss* Ounces	*Card Strips Total* Ounces	*Relative Humidity* %	*Temp.* °F.
Product #2	4	11 5/16	22 2/16	58	80 ± 2
Product #3	5	14	20 5/16	58	80 ± 2
Product #1	3	16 12/16	19 9/16	58	80 ± 2
Product A	4	14 11/16	21 8/16	58	80 ± 2
Product B	3	15 6/16	20 3/16	58	80 ± 2
Product C	4	12 13/16	22 4/16	58	80 ± 2

The data obtained by this procedure are given in Table I.

An examination of the fly-loss data in Table I indicates that fly loss was least in the lot processed with Product No. 2. Further examination of the data in this column illustrates that the other oils gave greater fly losses in the proportions set forth in Table II. Fly loss in mill operation is not a *down-the-drain loss,* of course, because the fly may be collected and reprocessed; but its importance is best appreciated when it is considered that fly loss is directly reflected in percent yield, a factor not to be neglected in any mill.

TABLE II

Comparison of Fly Loss with Oil #2 as a Basis for Comparison

Oil	*% Fly Loss over Oil #2*
Product C	13
Product #3	24
Product A	30
Product B	36
Product #1	48

While the fly losses listed in Table II may be considered significant, for fly loss is proportional to the amount of stock processed, a similar interpretation of the card-strip data in Table I would, it is felt, lead to erroneous conclusions. It is logical to assume that the build-up on the cards is most pronounced in the first few hours of a long, full-scale run. Since each card run at Lowell, during which card strips were collected, was of only two hours' duration, a direct comparison with much longer mill runs should not be made.

The data on fly loss and card strips demonstrate that the oils which gave least fly loss were generally productive of higher card strips. This is not surprising, for it has been found to be generally true that if fly loss is relatively low, card strips may be expected to be comparatively high. Of necessity, it is the correct balance of these two factors, fly loss and card strips, which gives high over-all efficiency in the carding operation.

Since the moisture-retention properties of wool oils are sometimes the subject of discussion, the moisture content of the various blends was determined at various steps in the carding operation. It will be noted from the data in Table III that there is no significant difference in the moisture regain in any of the lots at any one stage. It is therefore logical to deduce that there is no significant difference in the moisture-retention characteristics of the various oils tested. For the same reason no conclusions can be drawn concerning the effect of moisture content on fly loss and card strippings.

When it is considered that in each case 25% of water, based on the weight of the wool, was added to the stock in the process of oiling, it would seem that the figures under "% Regain-Oiled Stock Just Prior to Carding" should be approximately 35% since the wool blend contained 11% to 15% moisture originally. However, the oiled stock was subjected to greater than normal agitation in the small picker house at the Institute in contrast with the less violent procedures employed in the industry. This consideration leads to the conclusion that the above values are reasonable for the conditions of the tests.

Samples of stock prior to carding, of roping, of card fly, and of card strips of each run were taken, and oil-content determinations were made on these samples. The results are set forth in Table IV.

The discrepancies existing between the values in Columns 1 and 2 may be ascribed, in part, to the inevitable loss encountered whenever oil is applied by the sprinkling can.

The ether extractables of the uncarded stock and the ether extractables of the card strippings (Columns 2 and 5 of Table IV) demonstrate that the oil contents of the card strips are somewhat higher than the oil content of the wool fed to the card. The data in the same two columns of this table and in the Column "Card Strips" in Table I illustrate that the more oil applied to the wool, the higher is the oil content of the card strips, and the greater is the tendency for the wool stock to collect on the card clothing.

In the same manner a study of the data in the Column, "Fly Loss", in Table I and the Ether Extractables on Card Fly (Column 4, Table IV) indicates that the card fly is also higher in oil content than the main body of the wool, and that the more oil applied to the wool, the greater the oil content of the card fly, and the less the tendency of the wool stock to fly about.

TABLE IV

Oil Content of Wool Stocks and Wastes During Processing

Oil	*1 % Oil Applied*	*2 % Ether Extractables on Wool Stk.*	*3 % Ether Extractables on Roping*	*4 % Ether Extractables on Card Fly from under Intermediate Feed*	*5 % Ether Extractables on Strippings from Finisher Cylinder*
Product #1	3	2.5	2.4	3.9	2.7
Product #2	4	3.3	3.2	5.7	3.9
Product #3	5	3.7	3.3	6.3	4.0
Product A	4	2.9	3.0	5.3	3.6
Product B	3	2.7	2.6	4.2	3.2
Product C	4	3.3	3.0	6.3	3.7

SPINNING.—The roping of each lot was spun into a 3½-run yarn, having 9 twists per inch. The same atmospheric conditions (58% relative humidity, 80 ± 2°F.) and machine conditions prevailed throughout these spinning tests. All six lots spun equally well in every respect. Practically no breakage (ends down) in spinning occurred.

It was considered, however, that tensile strength and weight and variations in the strength and weight of the spun yarns would reflect the uniformity of penetration and fiber-controlling properties of the oils, since poor control may result in more thin places in the strand, thus producing a weaker yarn. Lack of uniform penetration or coverage may cause considerable variation within the test group of yarns.

Fifty-yard skeins of the yarn were wound for the strength tests; fifteen skeins were tested from each lot. A compilation of these tensile-strength data is given in Table V. This table indicates that the actual strengths of all lots of yarn were within acceptable limits. Product C produced yarns of highest strength, which, however, showed comparatively high-percentage variations in strength and weight. Product No. 2 possessed perhaps the best combination of actual strength, and variations in strength and weight.

WEAVING.—The six lots of 3½ run

TABLE III

Moisture Content of Stocks During Carding Expressed as % Regain

Oil	*% Regain Unoiled Stock*	*% Regain Oiled Stock Just Prior to Carding*	*% Regain Roping off Delivery End of Card*
Product #2	12	23	14
Product #3	12	23	15
Product #1	15	22	14
Product A	11	25	15
Product B	12	24	14
Product C	11	25	13

TABLE V

Yarn Strengths Obtained with Various Oils

Oil	Strength Pounds	% Variation Strength	% Variation Weight
Product #1	62.0	3.9	1.5
Product #2	64.3	2.4	1.4
Product #3	59.6	5.2	2.8
Product A	62.8	4.4	1.7
Product B	60.6	2.9	1.9
Product C	65.3	5.1	2.0

woolen yarn were woven on the same loom under conditions as identical as possible. No trouble was experienced in dressing the warps and weaving the fabrics. All yarns ran exceptionally well.

WET FINISHING.—The wet-finishing phase of the work at Lowell included fulling, scouring, centrifuging, and tenter-drying. Each lot was run individually for 30 minutes at approximately 90°F. in a sample fulling mill. The weight of the trap board alone was applied to the fabric and the rolls were operated at minimum pressure. The amounts of soap and soda ash used in the fulling of the fabrics were as follows:

Oil	Quantity of Soap Gel Applied in Fulling
Product #1, Product #2, Product A, Product B	19 pounds of a gel consisting of 1 ounce of soap and 1 ounce of soda ash per gallon
Product #3, Product C	19 pounds of a gel consisting of 2 ounces of soap and 2 ounces of soda ash per gallon

Heavier soap concentrations were used on fabrics containing Product No. 3 and Product C, since these oils are of such a chemical nature that greater amounts of soap are required for their efficient removal. A 39°-titer tallow soap was used in both fulling and scouring.

The fabric containing Product No. 1 was fulled first, and the fabric was processed to reasonable finish and measurements for a dress goods flannel fabric. This first run established the 30-minute fulling time described above. The other five pieces were then run in the same manner (exclusive of soap application, as noted) with the same pressures and time in the fulling mill. The finish and dimensions were allowed to develop as they pleased. The results of the fulling operations are given in Table VI, where the fabrics in each group are listed in the order in which the finishing personnel at Lowell rated them in regard to degree of fulling. In the first group the differences among the first three fabrics are not pronounced, as will be noted from the slight differences in the percentage decrease in area. However, the fabric treated with Product No. 1 fulled much less completely. In the second group the fabric treated with Product C fulled more completely than the fabric processed with Product No. 3. Of course these data should not be used to compare the fulling characteristics of the oils in one group with those of the oils in the second group.

In the scouring operation the amounts of soap and soda ash used were purposely maintained at values lower than are employed in many mills, for it was hoped that significant differences in the scourability of the oils would be emphasized in this manner.

Oil	Quantity of Soap Gel Applied in Piece Scouring
Product #1, Product #2, Product A, Product B	19 pounds of a soap gel consisting of 1 ounce of soap and 1 ounce of soda ash per gallon
Product #3, Product C	19 pounds of a soap gel consisting of 2 ounces of soap and 2 ounces of soda ash per gal.

The pieces were scoured individually in a Rodney-Hunt 4-string washer. The soap run was of 10 minutes duration with about 85 gallons of water at 110°F. The cloth was then rinsed at 110°F. for 35 minutes. This was followed by a cold-water rinse, after which the fabric was removed to the centrifuge. The centrifuged fabric was dried on a pin tenter dryer.

In Table VII the oils in each group are listed in the order in which the finishing personnel at Lowell rated them on the basis of suds generation. It is interesting to note that in the first group the amount of suds formed is not a reliable guide to the efficiency of scouring as determined by the residual oil content; two oils that formed very little suds, namely Product No. 2 and Product A, scoured out somewhat more completely than the oil which permitted the formation of larger quantities of suds. This lack of correlation between suds formation and residual oil content has also been borne out by the results of laboratory tests.

In the second group Product C permitted the formation of considerably more suds than Product No. 3, and was also removed more completely as evidenced by the lower residual-oil content. However, it should be borne in mind that a residual-oil content of 0.5% or below is generally considered satisfactory in terms of subsequent case of dyeing and finishing. Even when less than the normal quantities of soap and alkali were employed, the oils in both groups scoured out better than average.

DYEING.—Sample swatches of the six lots were dyed in the Dye Laboratory of the Lowell Textile Institute. The following procedure, a standard method at the Institute, was employed:

Dyestuff Used	Fast Wool Blue R
% Dyestuff Used	0.5
% Acetic Acid Used	2.5
Dye Liquor-Cloth Ratio	40-1

The dye bath was raised to 200°F. in one-half hour, at which time the dye bath was exhausted. The appearance of the dyed swatches indicated that all lots dyed

TABLE VI

Fulling Performance

Oil	Decrease in Length Due to Fulling (Based on 36" Length) %	Decrease in Width Due to Fulling %	Decrease in Area due to Fulling %
Product B	13	20	30
Product A	12	21	30
Product #2	14	18	29
Product #1	12	16	25
Heavier Soap Gel			
Product C	16	25	37
Product #3	11	21	30

TABLE VII

Scouring Performance

Oil	Amount of Suds	% Residual Oil
Product B	Moderate	0.24
Product #2	Less	0.22
Product #1	Less	0.51
Product A	Very Little	0.22
Heavier Soap Gel		
Product C	Heavy	0.14
Product #3	Very Little	0.26

satisfactorily. This was anticipated from the percent residual-oil values.

Conclusions

1. In addition to routine laboratory tests, certain especially designed tests and test devices are required to permit the development of superior wool oils. Typical of such special equipment are small-scale fulling and scouring machines, fiber-friction testers, condenser-tape testers, and electrostatic volt-meters.

2. Controlled mill-scale operations, such as those that are possible at Lowell, can be utilized to bring out differences in wool-oil performance, which would not be readily apparent in commercial mills. This is borne out by the fact that, although all of the oils tested at Lowell had proved acceptable in mill operation, significant differences in their performance were unearthed in the Lowell procedures.

Acknowledgments

The author is pleased to acknowledge the assistance and cooperation accorded him by the late Professor Russell L. Brown, and by Professors Henry L. Pero and W. S. Nowell of the Lowell Textile Institute.

NOTICE TO LOCAL SECTIONS

All technical papers and reports of discussions should be sent to the Editor of the Proceedings:

DR. CARL Z. DRAVES
435 Hudson Street,
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EMPLOYMENT REGISTER

This column is open for two insertions per year, per member, without charge. Blanks can be obtained from, and filed with, the Secretary of the Association, Lowell Textile Institute, Lowell, Mass. It is understood that these will be open to inspection by prospective employers, who can obtain further information from the Secretary.

50-7

Education: University, A.B.; chemistry and writing.

Experience: Chemist, production control and development, rayon and hosiery finishing.

Age 40; married; references; position in New York or Philadelphia area preferred.

3-20, 4-3

50-8

Education: Navy Flight School and Quartermaster Administration during war. New Bedford Textile Institute, graduating in June, 1950, textile chemistry, dyeing and finishing.

Experience: Salesman, part time during college work.

Age 30; married; references.

4-3, 4-17

50-9

Education: Textile High School.

Experience: Superintendent of Dyeing and Finishing.

4-3, 4-17

Report of L.T.I. Student Chapter Meetings

AT a special meeting held February 20, 1950, it was decided that an innovation in the procedure of regular meetings be adopted. Prior to the business part of each meeting a short paper concerning some phase of chemistry of general interest to the members is to be presented. At this special meeting, the first of such papers was presented by Alfred J. Richard; his subject concerned silkworm disease.

At the regular meeting on March 1, Robert M. Freeman presented a paper on Alchemists and Alchemistry.

Chairman Rebenfeld assigned a program committee to attend to the details of the program for the banquet to be held in conjunction with the N.N.E. Section on Friday, April 21, at Lowell Textile Institute.

Respectfully submitted,
DOROTHY A. McCARRON, *Sec'y.*

Atmospheric Gas Fading Tests

THE A.A.T.C.C. Research Subcommittee on Atmospheric Fading has been reactivated for the purpose of evaluating a new type of atmospheric fading testing apparatus wherein a test cycle of 4 to 10 minutes will reproduce the equivalent of one A.A.T.C.C. unit of fading. The present test requires 6 to 15 hours.

The new apparatus has been in successful use for one year and the work of the committee will make possible complete evaluation. The new committee has the following personnel: Herbert G. Scull, *Chairman*, A. M. Tenney Associates, Inc.; Mrs. W. N. Pardey, *Secretary*, General Dyestuff Corporation; Robert Burns, Celanese Corporation of America; Norman B. Gobeil, J. P. Stevens Company; James Greer, Burlington Mills Corporation; and William Masterson, Better Fabrics Bureau.

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Book Reviews

The Analytical Chemistry of Industrial Poisons, Hazards and Solvents

Morris B. Jacobs. Second edition, revised and enlarged. Chemical Analysis, Vol. I. xviii 788 pages. Interscience Publishers, Inc., 215 Fourth Avenue, New York, N. Y. 1949. $12.00.

This book would seem to be a must for any chemist confronted with a problem of industrial hygiene. The author has managed to bring together within its 788 pages not only the analytical methods, (some thirty-two elements and their compounds are discussed, as well as thirty-one classes of organic compounds) but a mass of other valuable data bearing on the problem of industrial hazards resulting from the use of chemicals.

There is a chapter on sampling of gases, another on sampling of dusts, and one on the examination of dusts. In the appendix are tables of Limits of Inflammability and Explosive Range, and Probable Safe Limits of Exposure to Gases.

The analytical procedures are given in sufficient detail to be followed by any chemist. It is gratifying to note that in one case where a reagent difficult to obtain was mentioned, the directions for its preparation were given. Physical as well as chemical methods of estimation are included. The chemist in any field looking for a method of determining a small amount of a substance would do well to consult this book.

The extensive coverage of the organic section would seem to include most of the compounds of interest to the textile chemist.

In view of the recent disclosures of the serious results of exposure to beryllium compounds, it is surprising to find the statement: "Beryllium metal and its ions are not considered poisonous but it may act as an adjuvant in certain instances."

The index is extensively cross-referenced and, happily, indexes also the very useful appendix.—W.G.C.

Handbook of Chemistry

Norbert A. Lange, Seventh edition, 1949. 1920 pages, $7.00. Handbook Publishers, Inc., Sandusky, Ohio.

The newest edition of Dr. Lange's famous *Handbook of Chemistry* is quite up to the high standards set by the earlier editions. A large number of tables have been extended or completely rewritten, and a number of new chemical tables have been added. Many of the values in the tables have been revised in accordance with more accurate data supplied by recent research.

Among the many tables that have been enlarged or rewritten, the following will be of particular interest to textile chemists: Plastics and Synthetic Rubbers, Typical Analyses of Various Public Water Supplies, and Standard Volumetric Solutions. Of the new tables, the mill chemist will be interested in the A.S.T.M. Classification of Coals by Rank, Formulas for Calculating Mineral-Free BTU and Fixed Carbon, and Partial Pressures of Aqueous Ammonia Solutions.

In order to keep the handbook to a single volume of convenient size yet include a wealth of new information, Dr. Lange has very wisely adopted the attitude that the tables of chemical information are of primary importance in a chemical handbook. Accordingly much of the mathematical subject matter found in previous editions has been deleted from the seventh edition. However all the mathematical tables and formulas bound under separate cover, are available from the publisher. The abbreviated mathematical appendix now contains the Greek Alphabet, Math. Symbols and Abbreviations, Areas and Volumes, Squares, Cubes, Roots, etc. of Numbers, Reciprocals, Circumferences, and Areas of Circles, Theory and Use of Logarithms, Four, Five, and Seven Place Tables of Logarithms, and a Four Place Antilog Table. The result is a well-indexed volume containing much new and valuable chemical information, yet retaining the convenient size of its predecessors.—J.B.M.

Textile Testing

John H. Skinkle, Second Edition, Revised 1949. 353 pages, $7.75. Chemical Publishing Co., Inc., Brooklyn, New York

This valuable reference work needs no introduction to textile technicians who found the first edition to be of immeasurable assistance in their daily laboratory work. Undoubtedly this revised second edition will prove to be even more valuable to laboratories concerned with the testing of textile materials.

The volume is divided into three parts: Physical Testing, Chemical Testing, and Microscopical Testing. Part I on Physical Testing takes up, in order, fiber testing, yarn testing, and fabric testing, except that the last chapter of this section covers strength testing in general. Some chapters are incomplete because of a two-year delay in publishing. For example, the chapter on Water and Fabric Relationships has nothing on the Rain Tester which has been accepted as a standard method by the A.A.T.C.C. for measuring water repellency, nor is there anything on the Hydrodynamic water repellency tester which has been received very enthusiastically in many quarters. Similarly, the chapter on Tactile and Draping Qualities omits some of the newer apparatus such as the Monsanto Wrinkle Recovery Tester which has appeared since the manuscript was written.

Part II on Chemical Testing is devoted to the methods used for the identification and determination of organic and inorganic extraneous matter in textile materials, analysis of fiber mixtures, and determination of damage to cellulose, wool, and silk. The chapter devoted to the analysis of fiber mixtures is also somewhat out of date, particularly quantitative analysis. For example the concentrated calcium thiocyanate method is given for the analysis of cotton-rayon mixtures, but the A.A.T.C.C. has recently replaced this method with the 60% sulfuric acid method.

Part III on Microscopical Testing, though brief, covers the essentials of textile microscopy as it supplements chemical testing. Identification of starches and fibers, and some of the quantitative microscopical determinations, such as wool grading, maturity of cotton, deconvolution count, etc. are described.

At the end of each chapter the author gives a very valuable bibliography of references to the original literature on the subject matter of the chapter. Included in each chapter are illustrations, diagrams, and tables relating to the information in the chapter. From the standpoint of ready reference, it would be more convenient to have the tables combined as an appendix to the text as they were in the first edition.

The volume has a table of contents and is well indexed for easy reference. The text is well written and the presentation is clear and logical. This book is a must for every control, testing, or research laboratory concerned with textiles because it contains so much diverse information on the testing of textiles.—J.B.M.

How Salaried Employees Benefit From Job Evaluation

R. M. Schmitz, National Foremen's Institute.

This small booklet, thirty pages in all, is a simple presentation of the objectives, techniques, and advantages of "Salaried-Position Analysis." Readable, well illustrated with catchy drawings, and direct in its treatment of every phase of the subject, the booklet should be a "natural" for the top executive faced with the chore of introducing job evaluation to his salaried personnel. It states its case sensibly, simply, and quickly, covering well the points that frequently rise to qualify acceptance of job evaluation by both staff and line employees.—J.R.R.

How to Be Human On The Job

Wallace G. Strathern, National Foremen's Institute.

Once again a booklet for the supervisor presenting nine points for "SUPERvisors," as they are called here. While there is nothing new about the material, its presentation—point by point—gives new life to some of the important things foreman training conference leaders have been hammering at for a long time. Not intended as a cut-and-dried patter for round-table discussion, this booklet is something truly in "the area of the specific 'how'" in which all levels of management could browse with benefit occasionally. It's good stuff, not new, but never old.—J.R.R.

Unterscheidung Der Textilfasern (Differentiation of the Textile Fibers)

B. Luniak, 114 pages, 12 ables, 288 photomicrographs. 30 Swiss francs. Verlag Leeman, Zurich, 1949.

This book opens with methods of freeing the fibers of dyes, finishes, etc., and then proceeds with the qualitative identification of fibers and analysis of their mixtures using physical properties, chemical properties, and microscopic methods; the latter are gone into at great length and with over-much description of apparatus and methods. The author then discusses the quantitative analysis of fiber mixtures by both physical and chemical methods.

Nothing new is offered in the book and much of American practice is omitted, but what is given is presented in a very compact and systematic way. The photomicrographs, as we have come to expect in Continental books, are excellent. In fact are the best features of the book.—J.H.S.

Textile Laboratory Manual

Walter Garner, 467 pages, price 30/-. National Trade Press, London, 1949.

In this new contribution to the field of textile testing, the author gives his methods of evaluating textile materials from the point of view of a commercial laboratory. Unfortunately many minor errors of spelling and nomenclature are present, some of which may be due to the printer. The opening chapters discuss the chemical analysis of fibers and fiber mixtures, after which the author gives several chapters on the physical evaluation of textiles. This, in turn, is followed by chapters on the analysis of finishes, color, surface-active agents, oils, waters, and chemicals in general; after this biological, optical, and viscosimetric methods are discussed. A chapter on statistical methods closes the book although, in the opinion of the reviewer, this might better precede the physical testing chapters.

The book contains a large amount of very valuable information which is rather difficult, at times, to locate. The author also assumes no knowledge of the physical or chemical properties of the fibers and sometimes takes an undue amount of space to give introductory material already available in more complete texts on textiles. As regards analysis of fiber mixtures, the A.A.T.C.C. methods are ignored; this seems to be standard practice in European texts. The author shows a tendency to ride a hobby in the case of certain tests which are relatively unimportant even although rather interesting; on the other hand, he has developed some very simple and useful tests which he rightly includes with more accurate but longer procedures.

On the whole, the book may be highly recommended as an addition to the textile chemist's library; its shortcomings are mostly due to overabundance of material and mechanical errors rather than to lack of basic information.—J.H.S.

ABSTRACTS

The Action of Fatty Acid Mordants and Tannic Acid in Dyeing Turkey (Alizarine) Red

R. Haller, Melliand Textilberichte, Sept. 1949, p. 410.

The author proved, in former publications (Farber Zeitung 1912, 489, 923 and Kolloid Zeitschrift XIII, 255), that fatty mordant used in dyeing Alizarine Red on Ca- Al- mordants does not form a complex compound with the dyestuff lake (as was supposed up to this time) but only had the effect of finely dispersing the lake to change dull color into the bright final shade obtained in standard processes. Polymerizing of the ricinoleic acid in steaming, probably by lactone formation, has to be assumed. The polymer can be extracted with alcohol, giving a soap-like, water insoluble mass after evaporation. Unexpectedly this mass reacted with metal salts. Generally the dyeing process is also combined with an aftertreatment with tannic acid, sumac or the like. The ricinoleic polymer was further found to react with tannic acid, forming a voluminous precipitate of unknown constitution. By dissolving aluminum acetate (prepared according to a special method in alcohol soluble form) in alcohol and adding tannic acid, a yellowish precipitate was likewise obtained which could be dispersed in water. This was dyed a dark red with Alizarine thus proving that tannic acid also played an essential part in Alizarine Red dyeing. The mechanism of this dyeing process appears to be very complex. Further investigations are contemplated. (In German)—P.W.

Alginates as Thickening Agents, According To Reports From U.S.A.

Anon., Melliand Textilberichte, Oct. 1949, 467.

Alginates proved to be superior to some standard thickening agents such as gum or tragacanth. Advantages here are exemplified in good solubility in lukewarm water, in excellent penetration (especially conspicuous in discharge pastes and padding operations) in forming sharp outlines in printing, and so forth. The pastes do not attack printing rollers or screen material. They have no reducing properties, thus being well suited for the use of dyes of the Rapidogen, Pharmasol, Diagene and Indigosol type. The higher price compared with gum trag is compensated for by a

better thickening effect; only 2% is needed for a satisfactory thickening effect. Naphtholates and basic dyes act as precipitating agents for sodium alginate and cannot be printed with algin thickeners. (In German)—P.W.

Crease Resistance of Textiles—Testing Methods

K. Quehl, Melliand Textilberichte, Nov. 1949, 535.

The author explained in a former article (Melliand Textilberichte 1939, 1; cf. Chemical Abstracts 33, 8415[9]) that the resilience of textile fibers is primarily caused by their structure and, furthermore, by some other reasons such as sorption, cross section, etc. The Tootal creaseproofing process, applying resin condensates, has been modified by several other similar methods. New ways have been found by the author in using boron condensates ("Preska" process), described among others in French Pat. 825,474 and Austrian Pat. 160,856 assigned to Theodore Rotta and furthered by Humphrey, suggesting the use of borosilicates (Brit. P. 457,659) cf. Chem. Abstr. 31, 2890[3], and by using salicylic acid (French Pat. 800,299). All of these methods are based on incorporating amorphous substances. The author developed some new products, offered under the tradename "Querox", generally omitting boron compounds. A new testing method is further offered, comprising a treatment of the finished fabrics by loading the samples with a standard weight (1 kg.) for 5 minutes and subsequently relaxing the specimen for 3 minutes; this testing method generally proved to be satisfactory. Some samples measured in an atmosphere of varying moisture content showed that the regain was retarded with increasing moisture content, depending also on a sufficient time of relaxation. The "Querox" treatment is said to have the effect of partially blocking the hydrophilic groups of cellulose. Reference is made to the recently published U. S. Pats. 2,479,303 and 2,482,470, describing devices for measuring the crease resistance. See REPORTER 1949, 766 and 956). (In German)—P.W.

Plastics and the Textile Industry

E. V. Giles, Journal of Textile Institute 40, P831-43, August, 1949.

Plastics employed in the textile industry may be divided roughly into two main classes: those which are capable of being "cured" and those which are not. They find uses as follows:

1. As components of textile plant or machinery. In this group may be mentioned phenol-formaldehyde (Bakelite), largely used for molded articles and for impregnating wood; Vulcanite as a covering for metal equipment; silicones for heat-resisting paints; and an acrylic resin for skylights.

2. As actual textile materials. This group includes the fibers nylon, Orlon, Terylene, the Vinyons, Velon, Saran, and "Pe-Ce".

3. As impregnating materials for textiles. Here we find polyvinyl alcohol used for warp sizing; chlorinated polyvinyl chloride, employed for fireproofing; silicone resins for waterproofing; methyl methacrylate for non-slip finishes; and other resins for crease-proofing, shrink-proofing, etc.

4. As coating or surfacing materials for textile fabrics for a variety of uses, such as rain-coats, leather cloths, flexible gasoline tanks, camera bellows, etc. The polyvinyl compounds are much used for these purposes, sometimes combined with synthetic rubbers.—W.H.C.

The Urea-Phosphoric Acid Method of Flameproofing Textiles

F. V. Davis, J. Findlay and E. Rogers, Journal of Textile Institute 40, T839-54, December, 1949.

The authors have investigated a process patented by the Bancroft Company in 1945 for flameproofing cellulose fabrics. They have reached the following conclusions:

The treatment of cotton fabrics with mixtures of urea and phosphoric acid followed by a "curing" at a temperature of 130-175°C. gives a flameproof finish which is resistant to hot water washing and even to mild soap scouring. The efficiency of the flameproofing has been shown to depend on the phosphorus content of the treated material, and for complete flameproofing a minimum of 3 per cent of phosphorus is necessary. This phosphorus is strongly bound by the cellulose and is not removed even by boiling 1 per cent caustic soda. It is associated with nitrogen present as the ammonium radicle and easily removed as ammonia by alkali.

Cotton fabrics flameproofed by urea-phosphoric acid lose some of their flameproof properties on repeated washing with alkaline detergents, but the loss of flameproof property is not due to removal of phosphorus, and the original degree of flameproofing can be restored by an acid treatment.

The evidence points to surface esterification of the cotton cellulose as the reason for the flameproofing effect and indicates that the ester present in the washed fabric is the ammonium salt of cellulose orthophosphoric acid, although the products of heating urea and phosphoric acid to curing temperature have been shown to be essentially di-ammonium pyrophosphate and cyanuric acid. The former is no doubt the active esterifying agent.

In the presence of the cellulose, the urea does more than just supply ammonia to form the ammonium salt of the acid and so reduce tendering; the excess urea is necessary as a medium to secure an effect which does not seem to be attained in any other way, i.e., the fixation of about 3 per cent of phosphorus without great loss of tensile strength.—W.H.C.

Artificial Daylight—a New Color Matching Unit. Part I

W. Harrison, Journal of Textile Institute 40, P1025-30, November, 1949.

Artificial Daylight in the Textile Industry. Part II

H. Hewitt, Ibid. P1031-35.

These two papers should be treated as one. The first outlines the requirements of an illuminant for color matching which will adequately replace daylight, such as the correct spectral distribution, reproducibility, and good illumination. It discusses the commonly used incandescent lamp with a filter to screen out excess yellow light; fluorescent lamps; and a combination of an incandescent lamp and a "blue" fluorescent lamp, the latter using as a phosphor either magnesium tungstate or blue calcium halophosphate. Such a combination, the author says, has a close approximation to natural daylight in its spectral distribution which is maintained throughout the life of the lamps.

The second paper gives in much detail the requirements for accurate color matching, such as normal color vision in the matcher, a source of light constant in spectral distribution and intensity, avoidance of eye-fatigue, and a neutral color for a background. The author points out that the combination-lamp already described (referred to as the "Siemens Unit") has a definite advantage over daylight for color matching because daylight is variable from hour to hour and from day to day. He states that the unit has been tested in various branches of the textile industry and very favorable reports have been obtained.—W.H.C.

Measurement of the Thermal Transmission of Textile Fabrics

G. Winston and S. Backer. (A.S.T.M. Bulletin No. 162). Textile Manufacturer 76, 51-6, Feb., 1950.

Numerous techniques for measuring the thermal-transmission characteristics of textile fabrics have been studied in the past. In general, the values reported by different laboratories for a given set of materials varied greatly.

In 1944, a special committee was organized by A.S.T.M. Committee D-13 on Textile Materials with the express purpose of developing a standard test. Cooperative

measurements were made on four woolen materials by seven large textile laboratories. The authors describe the type of equipment used in each of the laboratories and give the results obtained. They state, "Conversion of the data to a common unit of measurement where possible hardly provided the absolute agreement hoped for, but consistency in ranking the four materials with respect to thermal transmission was noted."

A second series of tests was made on 24 fabrics, ranging from 7 oz. to 32 oz. per linear yard, by five cooperating laboratories, the object being to provide for a more adequate comparison of the thermal transmission data with the physical properties of the fabrics. Tables are presented showing the relation between thermal values and thicknesses. Of numerous properties studied, only thickness evidenced a high relationship with thermal insulation values. The authors conclude, "Thickness values should suffice for the present in predicting fabric performance on the laboratory equipment designed to evaluate thermal transmission of textiles under still-air conditions, where the fabric under test has not been subjected to dye or other treatments which would, *per se*, alter its normal radiation characteristics". A bibliography is appended.—W.H.C.

Notes on Vat Color Printing

Technical Correspondent, Textile Manufacturer 76, 86-8, Feb., 1950.

"Vat colours may be applied successfully to all types of fabric but mainly to cotton, linen and viscose rayon. Cellulose acetate rayon may also be printed successfully, and wool and silk to a limited extent, using modified formulae."

The author gives a typical working formula for making a vat printing paste. He prefers the non-drying and non-freezing type of vat paste, and states that the powder brands require very careful handling. He says that potassium carbonate, compared with soda ash, has the advantage of higher solubility, but the latter is more commonly used because of lower cost. He compares the different reducing agents and states the advantage of each. He points out that glycerin not only is "the standard water-absorbing agent" but also has good solvent powers on many vat dyes. He states that dissolving salts are principally of value when steaming conditions are poor, and with some dyes they actually have an adverse effect. He believes that solvents, lubricants, and anti-foaming agents should never be added to the stock thickening, but only to individual print pastes as needed. He concludes with some advice about avoiding decomposition of the reducing agent in the print (by overheating, etc.) before the goods are aged.—W.H.C.

The Application of Rubber to Wool

R. W. Moncrieff, Textile Manufacturer 76, 82-5, Feb., 1950.

In this article, the last of a series, the author describes the application to wool of various rubber-like co-polymers (butadiene-styrene, butadiene-chloroprene, chloroprene-vinyl compound, etc.) and the shrink-proofing effect of each. He concludes: "The application of a rubber, either natural or synthetic, to wool can considerably reduce its shrinkability. The process which is best known in the United Kingdom is the use of 'Positex'. At present the degree of resistance to shrinkage imparted by 'Positex' is insufficient to meet the high standard now required by the trade. Other processes are being developed, and for some of these considerable claims in respect of resistance to shrinkage have been made. In particular, emphasis is laid on the good handle that rubber-treated wool retains; this is very important because the chief disadvantage of resin application processes is that the handle of the wool is affected by the resin. Possibly a combination of rubber and resin may eventually prove to be best, and in this connection the simultaneous application of 'Positex' and some of the resins appears to invite investigation."—W.H.C.

Faster Dyes for Knitted Wool Goods: Can the Dyer Meet This Demand?

A. W. Carpenter, Textile Recorder 67, 69-71, Feb., 1950.

Developments in the hosiery trade have been so numerous in the last few years that the busy manufacturer has often found difficulty in keeping abreast of the technique of his own business. If he attempts to obtain this from the dyer's own technical and scientific press, he may find himself overwhelmed by a mass of published matter, much incomprehensible to the lay mind. In this article the author attempts to give in non-technical language a survey of one phase of the story—recent consumer demand for faster colors—as it affects manufacturer and dyer. He discusses the proper selection of dyes for improved fastness to light and perspiration. For improved wash fastness he states that the two classes of greatest utility are the "milling acid" and chrome dyes. The former offer some difficulty in dyeing because of their high affinity for the fiber, resulting in unevenness. He describes the latest developments in chrome dyes, particularly the Neolan and Carbolan groups, and refers briefly to modern yarn and hosiery dyeing machines.—W.H.C.

Damage to Copper Rollers for Textile Printing

"Technicus", Textile Recorder 67, 80-83, Feb., 1950.

This is a discourse on practical methods of preventing and repairing damage to rollers. Copper is the most suitable metal for print rolls because it is malleable, easily engraved, and easily repaired. However, the surface is also easily damaged during printing and in storage, handling, etc. Chromium plating lessens the danger of damage.

The author states that "the angle of engraving in relation to the doctor edge should be about 55°." If it "approaches the parallel of the doctor blade edge", wear on the ridges of the engraving will be increased. He lists various causes of damage, such as foreign matter in the print paste (grit, sand, etc.), crystallization of dissolved chemicals (especially with vat dyes), corrosion of the doctor edge by pastes containing acid, particles of metal from the machinery, and even grit in the fabrics themselves. He offers suggestions for making repairs to the rolls when damaged.—W.H.C.

Dyeing and Finishing Mixtures Containing Acetate Rayon Staple Fiber

A. Mellor and H. C. Olpin, J. Soc. Dyers & Colourists 66, 44-9, Jan., 1950.

Spun rayon mixture fabrics are assuming a new importance in the textile world. Viscose-acetate blends are favorites, but acetate-wool is likely to prove equally popular. Acetate fiber mixed with viscose gives a resiliency and resistance to creasing which is not obtainable in a 100% viscose fabric. Acetate-wool blends have insulating properties equal to those of 100% wool, and the presence of acetate lessens the tendency to felting in laundering.

In processing acetate-viscose, removal of the sizing is the only pre-treatment necessary. Dyeing is done on a winch with the least possible tension. In dyeing solid shades on the two fibers it is sometimes difficult in matching to know which fiber is off-shade, and the suggestion is made that patches of 100% acetate and 100% viscose be attached to the fabric, and samples taken from these in addition to the samples from the blend.

Details are given for the production of solid black and navy shades, using diazotized and developed colors. Various treatments to prevent gas fading of the dyed acetate are suggested.

Acetate-wool blends require scouring, sometimes preceded by a mild crabbing. If acetate is to remain white, a selected line of acid or chrome dyes is recommended. Dyeing the acetate and leaving the

wool white is not practical, but careful selection of the dyes and control of the pH of the dye-bath will reduce staining of the wool to a minimum. Solid shades may be obtained by dyeing the wool first with chrome dyes and topping the acetate in a fresh bath, or by dyeing in a single bath with a combination of neutral-dyeing wool dyes and acetate dyes.—W.H.C.

A Modified Method for Neutralizing Carbonized Wool with Soda Ash

J. A. Perry, Textile J. Australia 24, 782-90, 852-3, Nov. 21, 1949.

"In the present method of neutralizing wool containing sulphuric acid, it is the accepted practice to use an alkaline solution containing soap and soda ash. In doing so, it is necessary to maintain a fairly high pH value to keep the soap in solution and lathering freely. Now, if only soda ash and no soap is used, the bowl may be allowed to process acid wool until there is no free soda left and the only alkali remaining is sodium bicarbonate. Despite the resultant relatively low pH value, the sodium bicarbonate is fairly effective in neutralizing further acid wool. Under the right conditions it can be made to neutralize all but traces of acid in the wool. The last traces may be removed in the usual way by a further bowl containing soap and soda ash, washing being achieved at the same time."

The author gives full particulars of the new process employing only soda ash, for which an application has been made for an Australian patent, and states that it has been used successfully on 100,000 pounds of carbonized wool.—W.H.C.

Dyeing and Finishing Nylon Flat Goods

F. A. Alter, Textile Age 14, 68-72, Feb., 1950.

This is a technical discussion involving the latest techniques, processes, and chemicals employed in coloring nylon and nylon blends.

Flat woven goods can be scoured on the jig, but new improved types of boil-off units have become available and are widely used, with greater production and uniformity throughout the lot.

For dyeing, an automatic tensionless covered jig equipped with instrumental control is the most efficient, producing even heat thoroughout the run and saving steam. The better type of acetate dyes meet most of the present market needs, giving good fastness to light and excellent penetration and coverage. The fast-to-light direct dyes are also practical and present no dyeing problem. For increased fastness to soaping, the acid or chrome dyes are employed, using a "graduated treatment" to ensure evenness. Vat dyes must be applied at high temperatures to secure good penetration and fastness.

Blends of nylon and pure silk have recently been in demand. For this purpose the direct dyes are quite satisfactory for ordinary requirements. For better fastness and brighter shades, a combination of direct and acetate dyes in the same bath may be used.

Wool and nylon blends are usually dyed with the neutral dyeing acid colors, but they must be carefully selected and the dyeing temperature kept under control. Chrome dyes are not recommended for this type of blend.—W.H.C.

Unshrinkable Wool Produced by Resin Treatment

"Technologist", Textile Mercury & Argus 122, 184, 187-9, Feb. 3, 1950.

"The idea behind the use of a resin is that the presence of such a substance in or on the wool fibers can be sufficient to modify their scale structure and prehaps also to change their elastic and plastic properties so as to decrease their tendency to felt. There is no doubt but that felting is to a large extent assisted by the peculiar uni-directional roughness of the wool fibers and that this roughness is due to their scale covering. By treating them with a resin this roughness can be much decreased and so result in the wool becoming appreciably less feltable. The important point about any process for making wool non-felting and which is based on the application of a resin is that it should result in no impoverishment of the wool fibers for there should be no substantial chemical reaction between the wool keratin and the resin. The resin should behave as a simple filling."

The author furnishes details of the Lanaset resin process and explains the chemistry involved in the melamine-formaldehyde reactions.—W.H.C.

Symposium on Textile Bleaching

Properties of Optical Bleaches

C. Teichgraber, Canadian Textile J. 67, 49-50, Feb. 17, 1950.

Optical bleaching agents are compounds which have an affinity for fibers. They are colorless in visible light and have a bluish-white fluorescence in ultra-violet light. They are used as whitening or brightening agents on bleached or semi-bleached goods to overcome the characteristic tint of such materials. As such they are replacing bluing agents, either dyes or pigments, which, because of added color, actually reduce the light reflectance. The optical bleaching agents have the opposite action and actually increase the light reflectance because invisible ultra-violet rays in daylight are converted into visible rays.

They have their limitations, however, because they are effective only in light containing an appreciable amount of ultra-violet, and should be used only on cloth to be exposed to daylight.—W.H.C.

The Bleaching of Cotton Cloth

C. F. Fitton, Ibid. 50-2, 55-6.

The author gives practical information on the advantages of desizing; the caustic scour; the use of peroxide for bleaching, and the precautions to be observed in chlorine bleaching, and in particular the control of the pH of the bleaching liquor. He comments on the modern use of the steam box (to replace the kier) in continuous bleaching with peroxide, and states that this method removes only one-half as much of the waxes and fatty material from cotton as the regular commercial kier boil.—W.H.C.

Bleaching of Rayon

C. E. Coke, Ibid. 56, 58, 60.

Bleaching of rayon is only required for white goods and fine pastel shades, because the raw materials are already bleached and rayon yarn and staple are commonly given a further semi-bleach by the manufacturer. The most popular bleaching agents used on rayon in Canada are sodium hypochlorite and hydrogen peroxide. Other less-used products are calcium hypochlorite, sodium perborate, sodium peroxide, sodium chlorite, and potassium permanganate. Details are given for the use of all these products.—W.H.C.

Wool Bleaching Problems

E. G. Drake, Ibid. 60, 62, 65-6.

The author stresses the importance of thorough preparation (scouring) of the material before bleaching, and a water supply free from sediment, organic matter, and iron and copper. Stains from these metals will result in holes after bleaching with peroxide.

The compounds commonly employed in bleaching wool are listed. Hydrogen peroxide is the most used product today. The preparation of the peroxide bath and the actual bleaching operation are described in detail. Sulfur dioxide (stoving) is still practiced in some places, but the result is inferior to the peroxide bleach. Sodium bisulfite is used today mostly as an after-treatment to improve the latter. Sodium chlorite is an "interesting new development." By its use simultaneous scouring and bleaching are said to be possible. Potassium permanganate is seldom if ever used.

The article closes with a brief note on silk bleaching with peroxide.—W.H.C.

TRADE NOTES • NEW PRODUCTS

• Agitator Serves Whole Tank Row

A single heavy-duty liquid agitator developed by Mixing Equipment Co., Inc., 1024 Garson Ave., Rochester 9, N. Y., which can be moved quickly from one tank to another for batch mixing and blending reportedly will serve up to 40 tanks, in any order desired.

The unit was originally developed for paint tinting. Operating tests are said to indicate that the new agitator will handle the tinting process in one-eighth to one-sixth the time formerly required.

The agitator is a turbine-type unit, ready to operate when connected to plant electrical supply. Mounted on casters, it rolls on a track from tank to tank as required. Correct mixing speed for each individual batch can be selected with a simple variable speed control.

The impeller shaft and turbine-type impeller are raised and lowered in the tank hydraulically. To switch from one tank to another, the operator sets two levers, releases a floor lock and wheels the unit to its new position.

The product is fitted with two integral baffles that raise and lower with the impeller. These baffles are designed to promote rapid and thorough mixing and are said to eliminate the expense of attaching baffles to a number of tanks, with consequent cleaning problems.

The unit is supplied in capacities up to 4.5 H.P. at the impeller. The manufacturer recommends and supplies the correct electric motor and impeller size for the individual application. Shaft, impeller and baffles can be furnished in a wide variety of metals to suit individual process requirements, the manufacturer states.

• Moistureproof Glass Electrodes

A series of moistureproof glass electrodes has been developed for Leeds & Northrup pH electrode assemblies of the pyrex glass and enameled cast iron types. (Leeds and Northrup Company, 4934 Stenton Ave., Philadelphia 44, Pa.)

To assure high insulation and low electrical leakage, electrode lead-wires are permanently molded into the plastic electrode head thus maintaining fine accuracy even under conditions of high atmospheric humidity, the company states.

New pH-responsive glasses are said to offer fast response, low resistance, and sodium error so low that the same electrode can be used for any range of acidity or alkalinity.

Electrodes are color-coded for three ranges of solution temperature: 0 to 30 C.; 20 to 60 C.; 50 to 90 C.

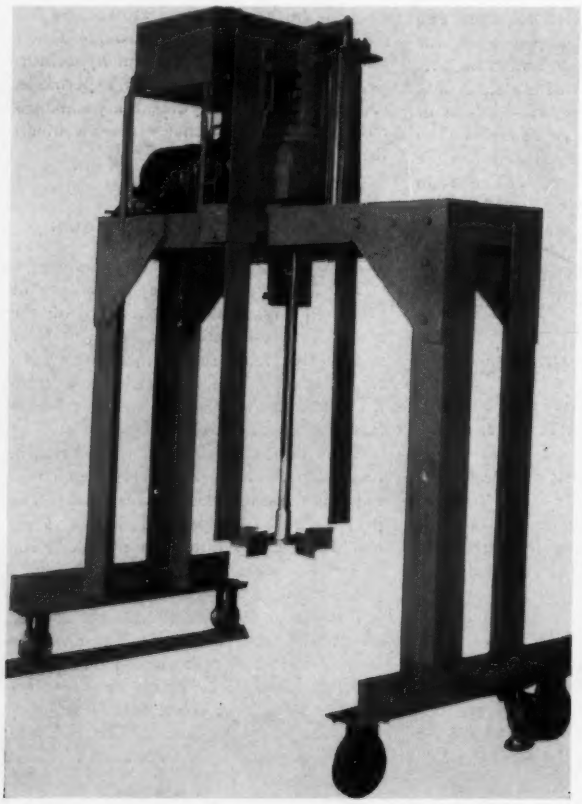
• Stainless Steel Acid Tank

A new SMO stainless steel acid tank for use in cloth carbonizing ranges has been announced by Riggs & Lombard, Inc., Suffolk St., Lowell, Mass.

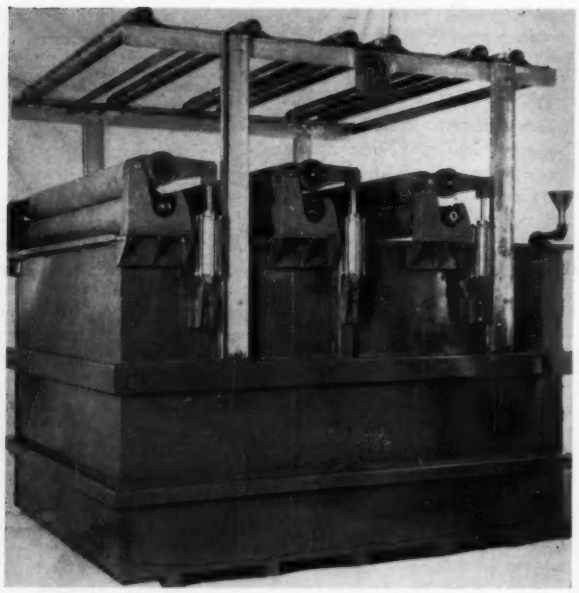
According to the manufacturer, the new type tanks will afford maximum resistance to acid and a longer life than other types now in use, is easier to keep clean and has no rubber lining to damage or replace.

Constructed entirely of SMO stainless steel, the need for recovering carrier and immersion rolls is eliminated, it is stated. The carrier sky rolls are located above the tub rim to give a longer soaking time. There are 3 standard sets of squeeze rolls, rubber-covered for pulling quality, and proper squeeze.

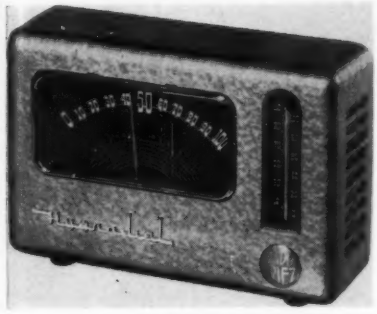
Heavy stainless steel channels reinforce the tub on the outside. The new model is normally supplied with air pressure equipment. A compressed air circulating system is at one end to keep the acid in the tub constantly agitated and to insure even condition throughout the tank.



MEC Agitator Lightnin



Riggs & Lombard SMO Acid Tank



The Hygrodial

● "Read-at-a-Glance" Hygrodial

The Abbeon Supply Company, 58-10 41st Drive, Woodside, New York, N. Y., distributors for the Friez Instruments of The Bendix Aviation Corp., announces that a new direct reading Humidity and Temperature Indicator to be called the Hygrodial is now coming off the production lines after exhaustive field and laboratory tests.

The Hygrodial is a direct reading instrument said to show at a glance the Relative Humidity and Temperature of the air to which it is exposed. It has rubber feet for setting on a desk or table and also provision for wall mounting.

The humidity scale is graduated into 10 equal divisions from 0 to 100% over an area of 2½ inches and is clearly marked. This new indicator is reported to be highly accurate and to maintain its calibration.

The Thermometer is a red liquid filled, lens front type reportedly accurate to within 1° at 70°F.

Both sets of numerals are satin-finished aluminum on an etched black background. Slots on each side and the bottom afford maximum ventilation for quick sensing by the motivating element, which is composed of 216 inches of fine blond human hair.

Overall dimensions are 5⅜ inches long by 3⅝ inches high by 1-11/16 inches deep. Weight 9 ounces, shipping weight 1 pound. Price, $18.00.

Information and literature may be obtained from The Abbeon Supply Company.

● Ion Exchange Bed Exhaustion Signal

A new concept in deionization—the use of a special dyed mixture of Amberlite resins which change color as the bed becomes exhausted—has been developed by the Resinous Products Division of Rohm & Haas Company, Philadelphia chemicals manufacturer. Addition of the new indicating feature affords a means of checking qualitatively the exhaustion point of the bed.

Dyed a dark blue in its regenerated state, the Monobed becomes a yellowish brown when exhausted. The user, operating such a bed in a transparent tube or vessel, reportedly can watch the latter color travel slowly down the bed as exhaustion advances. Thus, without instrumentation of any kind, he has accurate knowledge and ample warning of the time when he should regenerate or replace the resins, the company states. It is further stated that capacity of the bed to adsorb ionized salts is not exhausted until the brown line reaches the bottom of the bed.

This visual means of determining the end-point depends in operation on the combined performance of an anion exchanger and a cation exchanger. Together, they are said to prevent leakage from the bed and result in a sharp, rather than a gradual separation of colors.

● Bulletin on Beta Substituted Propionitriles

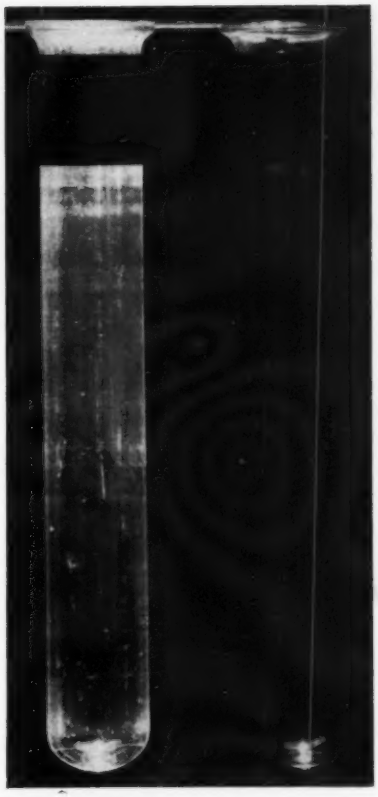
New Product Bulletin No. 12, concerning the physical and chemical properties of four beta substituted propionitriles, of which three are new products, has been published by the New Products Development Department, American Cyanamid Company. The products concerned are B-dimethylaminopropionitrile, B-isopropylaminopropionitrile, B-methoxypropionitrile, and B-isopropoxypropionitrile.

The alkylamino compounds are miscible with water and the alkoxy compounds are soluble to a lesser degree, but all four nitriles are soluble in the common organic solvents, it is stated. The chemical reactivity of these nitriles has led to their potential application as intermediates for the synthesis of new plasticizers, dyes, resins, and insecticides. In order to make the data of this group of compounds more readily available, New Products Bulletin No. 12 has been prepared.

Copies of this bulletin may be obtained by addressing the New Product Development Department, American Cyanamid Company, 30 Rockefeller Plaza, New York 20, New York.

● Added Safety to Lab Glassware

Exposure of laboratory glassware to ordinary detergents is said to cause measurable weight loss, etching or cloudy appearance and weakening of the glass while etching makes it more difficult to wash and rinse glassware and may result in carry over of soil to interfere with subsequent use. Field tests of both Wyandotte Dural H and M, newest Wyandotte Chemicals Corporation cleaning products, show that these inhibited detergents overcome the former difficulties and insure the maximum life and usefulness of the glassware,



The test tubes shown above were reported immersed for eighteen hours at 210°F. in 0.30% solutions of glass washing detergents. Wyandotte states that the badly etched tube at the left was exposed to a standard detergent solution while the new-looking tube at the right was immersed in Wyandotte Dural H.

the company states.

Wyandotte Dural H is said to wash quickly and thoroughly in hard water, produce little or no etching and dissolve laboratory glassware at rates from 2 to 33 times slower than standard detergents. A companion product, Wyandotte Dural M, has been originated for the *machine* washing of laboratory glassware.

Wyandotte Dural H reportedly penetrates rapidly, protects glassware and workers' hands, and reduces etching to a minimum. The same advantages are gained with Dural M for machine washing of laboratory glassware, it is stated. Both products are said to be ideal for washing culture and test tubes, Petri dishes, Erlenmeyer flasks, centrifuge tubes and laboratory glassware of all kinds.

● "Warmth Without Weight" Fabrics

A new process for treating a wide variety of textile fabrics to substantially increase their ability to provide warmth without weight was demonstrated in a press preview recently at the Waldorf-

Astoria by Deering, Milliken and Co., Inc.

By means of this new process, nylon, cotton, rayon and wool reportedly can be made to give the wearer a substantial increase in warmth. The company claims that a treated rayon satin lining, after being processed, will be twelve per cent warmer than the combination of the same rayon satin lining untreated and an eleven-ounce wool lining, such as is used in "Zip out" men's and women's coat. It is also claimed that nylon seersucker blanket cover treated by the new process will provide more warmth than a three and a half pound wool blanket. The first consumer products to use these new fabrics will be marketed this coming autumn.

The process was described by Roger Milliken, president of Deering, Milliken and Company, Inc., which has been actively at work on its development for several years with the original research done by H. J. Rand and Associates, Cleveland, Ohio.

"We have conducted exhaustive tests of these new fabrics, both in our own research laboratories and in those of the United States Testing Laboratory at Hoboken and at the Rand Textile Development Corporation laboratories in Cleveland," Mr. Milliken said. "The fabrics we have treated have proved conclusively their ability to prevent heat loss by radiation, which accounts for as much as 85 per cent of the loss of body heat in cold weather. In addition, however, these new fabrics also maintain their porosity, permitting the body pores to breathe." This is said to make these fabrics equally ideal for warm-weather wear.

The demonstration showed by means of an infrared lamp's heat and a special heat measuring device that these new fabrics reflect back the heat thrown against them. This device was developed by Deering, Milliken to simulate the body's heat loss through radiation and to scientifically measure the ability of various fabrics to prevent this heat loss.

Initially Deering, Milliken and Company, Inc., will process fabrics at their own mills in various parts of the country. Later they plan to develop a program for licensing others to use this process to provide a supply of fabrics to meet a demand which has already started to express itself. The process has been protected by a large number of patents. Garments using these fabrics will subsequently be identified by a trademarked name, which has yet to be selected from a number now under consideration.

• Hardness Measured in One Minute

Total water hardness, and the hardness caused by calcium alone, now are claimed to be accurately measured by simple, easy methods in approximately one minute.

Hall Laboratories, Inc., Pittsburgh, in announcing the new total-hardness methods, reported that they are based on the discoveries of Dr. Gerold Schwarzenbach, with Hall modifications that make them convenient for general field use.

The improved methods developed by Schwarzenbach and his associates in Switzerland have been completely confirmed as to accuracy and validity through intensive research and test application by Hall investigators, the Pittsburgh consultant firm announced.

The new Hagan Total Hardness Test, as it is designated, is said to be immeasurably superior to the "soap shaking" method in general use in the past. It involves a simple, direct titration with a distinct color change at the end point, so that the possibility of error due to subjective judgment is eliminated. It is stated that interferences, although seldom found, are easily eliminated.

The test is reported to be a direct titration to a clear-cut color change with no heating, waiting, filtering or estimating required. The answer, correct to less than 1 ppm. of calcium, is found in one minute, the announcement states.

Where it is desirable to determine hardness due specifically to magnesium in the water, the operator makes the total hardness test and the calcium test, the difference giving him the magnesium value.

All equipment and reagents required for either the Hagan Total Hardness Test or the Hagan Calcium Test is being made available through Hagan Corporation (parent of Hall Laboratories, Inc.) and its associated firms, Calgon, Inc., and The Buromin Company, the announcement adds.

• Merger Offer Reported

Imperial Chemical Industries Limited of England is reported to have made an offer to acquire a controlling interest in Arnold, Hoffman & Co. Incorporated, chemical manufacturers of Providence, Rhode Island.

If the offer is accepted it will enable Imperial Chemical Industries Limited to enter into the manufacture of dyestuffs and other synthetic chemical products in the United States as well as to provide a medium through which dyestuffs and auxiliary products manufactured by Imperial Chemical Industries Limited can be marketed in this country, the report states. It is further stated that Arnold, Hoffman & Co. Incorporated has an Issued Capital of approximately $930,000 consisting of approximately 93,000 Common Shares of a par value of $10, and the price offered by Imperial Chemical Industries Limited is $55 per share. The American corporation operates three plants, at Charlotte, North Carolina, Cincinnati, Ohio, and Dighton, Massachusetts, and is engaged in the manufacture of a variety of chemical products including dyestuffs, plasticizers, printing gums, sulfonated oils, synthetic resins, and wetting agents.

If this offer is accepted, the necessary finance will be provided by bank loan in New York and the transaction therefore will not involve the use of any of Britain's dollar resources, the report concludes.

• Fiberglas Screen Print Drapery Fabrics

Owens-Corning Fiberglas Corporation has announced that it has solved the problem of printing on glass with the development of Fiberglas Screen Print Drapery fabrics.

Announcement of the fabrics, said to have good basic textile characteristics including satisfactory wearing and cleaning qualities, soft hand and excellent color retention, follows three years of research and experimentation at the Fiberglas Textile Processing Laboratory at the company's Ashton, R. I. plant. They reportedly will be available in quantity to decorators this fall and it is anticipated they will be available on the retail level at the same time.

The new printed fabrics are said to have characteristics of incombustibility; wrinkle-resistance to the extent that no ironing is necessary; soil resistance; ease of cleaning; permanent retention of shape; water repellency; good draping and hand; excellent light fastness; shrink, rot and mildew proofness, dimensional stability and decorative translucency.

The method of screen printing Coronized Fiberglas fabrics is known as the Hycar-Quilon method. It is stated that this process of screen printing parallels the water-dispersion type resin-pigment systems now in common usage on cottons, rayons, nylons and others; however, the resin and aftertreatment have been chosen as being the only combination which will give excellent wash fastness and resistance to crocking while still not impairing the wrinkle resistance, the drapability and incombustibility of a Coronized glass fabric. This method is said to entail no serious deviation from standard screen printing techniques.

Fiberglas fabrics are prepared for printing in the Coronizing Department of the Ashton plant. The fabric is subjected to the 1,200 degree Fahrenheit heat treatment which reportedly renders its fibers soft and pliable and permanently sets the crimp which gives it its wrinkle-resistance. At this point the fabric is given a very light coating of a cationic agent which serves as a lubricant and protec-

tive agent for the bare glass fabric during subsequent operations and which further prepares the surface of the fabric for acceptance of the printing paste.

The goods are then ready for printing on a standard printing table and with standard screens. The paste is a latex water dispersion which has the consistency of normal, workable pastes to which printers are accustomed. After printing, the goods require a 300 degree Fahrenheit cure followed by a 15-second immersion and padding in a Quilon solution and a final drying at 250 degrees Fahrenheit. To further enhance the hand of the fabric and entirely eliminate creasemarking, a soap scour in a dye beck or open-soaper is recommended by the manufacturers.

The printing paste formula is:

79 parts (by volume)—Keltex Solution (3 ounces per gallon).

20 parts (by volume)—Hycar OR-1542.

1 part (by volume)—Tergitol No. 7.

In the development of the screen printing process, every attempt is made to keep it as near to standard screen printing procedures as possible. Any well-equipped printer will not have difficulty with this process, it is stated. The printing formulation is of the resin-pigment type. A latex binder is brought to the consistency of standard, workable printing pastes through the use of a thickener. The Fiberglas Textile Processing Laboratory at Ashton has screened the pigments of all the leading dyestuff houses and a recommended list of these pigments will be made available to printers wishing to work on Fiberglas fabrics. Inquiry should be made to the Textile Laboratory, Owens-Corning Fiberglas Corporation, Ashton, R. I.

The pigmented paste is reportedly applied in the same manner as in the printing of cottons and rayons. The rate of drying on the table is said to be such that one screen can follow another with no unusual waiting period involved. Since this paste is of the water-emulsion type, screens are washed out by the expedient of a water flushing with a hose. Should a screen be allowed to dry out with this paste still in it, the pores of the screen can be cleaned out by scrubbing with a soft cloth that has been dipped in turpentine, it is stated.

After printing, the goods require a cure at 300 degrees Fahrenheit for about one-half minute. This is followed by a 15-second immersion in a dilute solution of a special aftertreatment and then a drying at 250 degrees Fahrenheit. It is here that the wash-fastness and dry-cleaning fastness are determined. The aftertreatment is said to also give a permanent water-repellency to the fabric.

To attain the best hand and to eliminate any possibility of creasemarking a thorough soap scour in a dye-beck at 120 degrees Fahrenheit is recommended by the company followed by a frame drying.

The fabric is a launderable one and the color loss in any of the common soaps and detergents is claimed hardly discernable. It is reported to have the fastness of a vat-dyed cotton and no method of laundering will affect its wrinkle resistance, it is stated. Ironing is not required after laundering. The fabric is said to have been hand laundered for 360 consecutive minutes in soap at 105 degrees Fahrenheit with no appreciable loss of color in the body of the goods. Machine laundering was carried out at the Ashton laboratories in two commercial types of machines, with soap at 110 degrees Fahrenheit. In one unit, 180 minutes of continuous washing reportedly showed results parallel to those attained in hand laundering. It is estimated that the 180 minutes of washing in the machine represents more than 16 washings. Simulated soil was removed in five minutes of soaping, followed by two three-minute rinses. A five-minute soap cycle at 110 degrees Fahrenheit followed by two three-minute rinses at 110 degrees is recommended by the company, all at low speed of 7 r. p. m. Water with temperatures up to 160 degrees Fahrenheit may be used without any loss of color although all laundering tests at Ashton were made in warm water with temperatures between 105 and 110 degrees Fahrenheit, it is stated.

It is recommended by the company that dry cleaning be done only with Stoddard Solvent. A five-minute Stoddard-soap cycle followed by a five minute solvent rinse in a cascade type machine is needed, it is stated and as in laundering, extracting and tumbling should be avoided. Cabinet drying is suggested.

Fastness to light of the new fabrics is on the highest plane to be found in dyestuffs since pigments are used in the printing, the company states. Fastness reportedly varies with the pigment but it is stated that by careful selection a printer may keep his rating close to the 100 hour mark and well above the minimum 40 hours set by the trade.

The fabric is said to more than pass the standard A.S.T.M. tests for fire proofness. Where a two second flame is permitted, the fabric reportedly does not sustain the flame.

• PTI Research Program

The Philadelphia Textile Institute has announced the creation of two new administrative posts in its research department to further the development of its research program.

Professor Percival Theel, who formerly headed the Chemistry and Dyeing Department, has been appointed Coordinator of Research. Professor Theel graduated from the University of Pennsylvania in 1916 and has been with PTI since that time. He is a member of the American Chemical Society, American Optical Society, American Society for Testing Materials, Engineers Club of Phila., a Fellow of the American Institute of Chemists and a charter member of the American Association of Textile Chemists and Colorists. He is also a member of Phi Psi, national textile fraternity. For the A.A.T.C.C. he serves as a member of the Executive Committee on Research, and chairman of the Publications Committee and of the committee on Standard Methods of Chemical Analysis and Testing. Professor Theel has been released from all departmental and teaching duties and will confine himself to the development of the program.

Percival Theel

B. Russell Koenig, Associate Professor in Charge of Jacquard, Color, Testing and Microscopy, has been named as Assistant Coordinator of Research. Professor Koenig is a graduate of PTI and has been teaching since 1942. He was with National Automotive Fibers in Detroit for seven years and at present is a member of a firm of consultants engaged in fabric development and research. His memberships include Phi Psi, American Society for Testing Materials, Textile Research Institute, Intersociety Color Council and the Optical Society of America.

The reactivation of the program of research projects for industrial firms and governmental agencies was authorized by the Institute's Board of Trustees.

• NCTF Annual Session

The North Carolina Textile Foundation, Inc., held its annual session at N. C. State College Saturday, February 25.

The organization, which has funds totaling approximately $1,200,000 and which was the first educational foundation of its type organized in North Carolina, also reelected officers, named 24 directors, and heard addresses by Chancellor J. W. Harrelson of State College and Textile Dean Malcolm E. Campbell.

Around 300 representatives of the textile industry from North Carolina, South Carolina, Virginia, and other states attended the meeting and toured the new

$700,000 additions to the School of Textiles Building. The meeting was held in the new auditorium.

W. J. (Nick) Carter of Greensboro, viceprseident of J. P. Stevens Company, was reelected president of the Textile Foundation. He has served as head of the organization since its establishment in December, 1942.

Other officers, all of whom were reelected, are Dr. A. G. Myers of Gastonia, president of Textiles, Inc., vice-president; David Clark of Charlotte, president of the Clark Publishing Company, secretary; William H. Ruffin of Durham, president of Erwin Cotton Mills, treasurer; and Aaron B. Quinn of Greensboro, assistant sceretary-treasurer.

The directors who were unanimously elected are as follows:

Charles L. Amos, High Point; Carl J. Beaver, China Grove; C. A. Cannon, Kannapolis; Josiah Carter, Atlanta, Ga.; W. J. Carter, Greensboro; Thurmond Chatham, Elkin; David Clark, Charlotte; John W. Clark, Franklinville; Carl A. Cline, Hickory; Clyde Gordon, Burlington; Herman Cone, Greensboro; J. C. Cowan, Greensboro; S. W. Cramer, Jr., Charlotte; R. S. Dickson, Charlotte; A. M. Dixon, Gastonia; B. B. Gossett, Charlotte; Hugh M. Grey, Concord; P. H. Hanes, Winston-Salem; R. M. Hanes, Winston-Salem; Henry L. Harris, Galax, Va.

R. L. Harris, Roxboro; W. C. Harris, Winder, Ga.; Edwin Spier, New York, N. Y.; Alexander F. Ix, Englewood, N. J.; Joseph P. Kelly, Burlington; K. P. Lewis, Durham; J. Harold Lineberger, Belmont; J. Spencer Love, Greensboro; George L. Lyerly, Hickory; William Nobel, Charlotte; John F. Matheson, Mooresville; Reid A. Maynard, Burlington; J. Ed Millis, High Point; E. A. Morris, Greensboro; A. C. Myers, Gastonia; W. H. Ruffin, Durham; W. P. Saunders, Robbins; A. Alex Shuford, Hickory; K. S. Tanner, Spindale.

E. A. Terrell, Charlotte; N. W. Turner, Lynchburg, Va.; John K. Voehringer, Greensboro; G. W. Walker, New York, N. Y.; H. W. Whitcomb, Spray; and C. D. Williamson, Fort Worth, Texas.

Reporting on the first half century of service made by the State College School of Textiles, Dean Campbell said that the past year has seen the school conduct its biggest building program, as authorized by the 1947 General Assembly, and graduate its largest senior class of 303.

The school, he said, has educated 1,600 students since it was established in 1900. It has seven main curricula relating to specialized textile fields and has a total enrollment of 751 students, 68 per cent of whom are from North Carolina and 32 per cent of whom come from 26 states and 16 foreign countries.

Dean Campbell told of the work of the school's Placement Bureau, headed by G. H. Dunlap, and said that the bureau serves both the students seeking employment and industries seeking new personnel.

Chancellor Harrelson said that State College is now shifting its curricula to provide for a combination of classical learning and technological training. He was introduced by J. Ed Millis of High Point, a member of the foundation's board of directors, who served as chairman of the meeting. President Carter opened the meeting and presided.

The secretary's and treasurer's reports were made by David Clark of Charlotte, the foundation's secretary. Mr. Clark also made a brief talk in which he praised the work of Mr. Carter in starting the movement which led to the Textile Foundation's organization.

The foundation, in a brief business session, named the Wachovia Bank and Trust Company as its fiscal agent and voted to hold its annual meetings at the State College School of Textiles the fourth Saturday in February at 11 a. m.

• R. I. School of Design Plays Host

Rhode Island School of Design played host on the evening of March 1 to over 200 key representatives of the textile industry of Rhode Island, Massachusetts and nearby Connecticut at a dinner meeting and inspection of the School's new pilot plant. Addresses were delivered by William D. Fales, Chairman of the Division of Textiles and Clothing; Max W. Sullivan, President of Rhode Island School of Design; Michelle Murphy, Industrial Design Consultant of the Brooklyn Museum; Dorothy Liebes, designer and weaver of California and New York; Kenneth B. Cook, Vice President and General Manager of Crown Manufacturing Company.

During the period immediately following World War II many thousands of dollars have been invested by Rhode Island School of Design in the Division of Textiles and Clothing in a program of complete modernization of equipment. This program is now reported to have reached a significant stage in its development. Among the numerous developments at the school the design studios and fabric printing laboratory have been refurnished, new equipment has been added and will shortly be more adequately supported by the installation of finishing equipment in the dyeing and finishing laboratory. The inspiration and advice of Dorothy Liebes, has been a most important factor in the shaping of the School's program in this important field.

The addition of new equipment is said to materially strengthen the four broad basic courses offered by the School in the fields of yarn and cloth manufacturing, textile chemistry and coloring, textile design, and clothing design and construction.

In Mr. Sullivan's address he cited the help of numerous industrial, state and private organizations and individuals in raising Rhode Island School of Design to its present state. Among others, he lauded William D. Fales as Chairman of the division of Textiles and Clothing; G. Pierce Metcalf of the Wanskuck Company and E. Kent Swift of the Whitin Machine Works for their help in attaining woolen and worsted system equipment; and Royal Little and Bayard Ewing for their parts in the establishment of the New England Textile Foundation and the Rayon Foundation Trust, respectively.

• Chattanooga to Repeat Textile Course

The University of Chattanooga has announced that it is repeating again in the evening college its course in General Textiles given for the first time last year. The course is under the general direction of Dr. William F. Luther of the Industrial Research Institute and Director of Research of the Dixie Mercerizing Company.

The course has been designed to give the student a broad basic understanding of the principal fibers and fabrics in the shortest possible time. This has been attempted in a series of 15 two hour lectures given by men of practical, research and teaching experience in their major field, including Dr. Luther, R. P. Cochrane, Jack Anderson, Paul Lawton, W. Jack Welborn, J. A. Crumley, D. H. Gunther, Dr. Charles King and Nathan Roberts. These lectures are interspersed with displays of fibers, yarn and fabrics for examination by the student. The use of films and plant visits to the major types of textile mills within the Chattanooga area is encouraged.

• LTI To Offer 4-Year Paper Course

Kenneth R. Fox, President of the Lowell Textile Institute, Lowell, Massachusetts has announced that beginning in September, 1950, the Institute will offer a four year course in Paper Engineering, leading to the Degree of Bachelor of Science. This course will emphasize paper manufacturing, paper use and converting approaching these subjects from the basic engineering and chemical principles involved.

Dr. Geoffrey Broughton will direct the new department. A former varsity fellow at the Massachusetts Institute of Technology, he has taught at Queen Mary's College of the University of London, at M. I. T., at the University of Rochester and at Rochester Institute of Technology. During the last war Dr. Broughton was in charge of chemical intelligence for the city of London and before coming to Lowell Textile Institute was associated with a film manufacturing plant at Rochester, New York as a superintendent of the paper service department.

In preparation for the inauguration of the Paper Engineering course, a new building will contain one floor of approximately 12,000 square feet in area which will house the new department. This building reportedly will be ready for occupancy in time for students admitted in 1950 to utilize the new facilities. These will comprise fully air conditioned rooms, a large engineering laboratory for unit operations, a coating laboratory and converting laboratory to house machinery for laminat-

ing, embossing, printing and other pertinent operations, it is reported.

Among the subjects offered in the Paper Engineering course will be Wood Technology, Pulp and Paper Manufacture, Paper Testing Methods and Paper Coating and Converting.

Throughout the course, provision will be made so that students may gain practical experience in paper mills and converting plants.

• Machinery Exhibition News

The American Textile Machinery Exhibition to be held in the Atlantic City Auditorium May 8-12, the first staged by the National Association of Textile Machinery Manufacturers in eleven years, will literally be a five million dollar show. The displays of some of the larger firms will reportedly cost well over $100,000 each and all of the exhibits will be in operation. Several concerns already have announced that they will show and demonstrate the newest machinery they have in production and that which has been developed but which is not yet in production, as well as pilot models of the latest advances emerging from their research laboratories. More than 3,000 people are needed to stage, conduct and maintain the exhibition and over 200 companies have taken display space.

In the years since the Association's last show new fabrics, fibers and processes have been developed, necessitating the conception and production of new machinery. The newest designs, refinements and accessories in this equipment will be shown.

"From all indications the attendance by company executives, mill officials, sales managers and key men in all branches and departments of the textile trade will be very heavy," said Erwin N. Darrin, Vice President of Draper Corporation and head of the Exhibition Committee. "Many of the large textile mills throughout the country are planning to send groups of their superintendents, overseers and foremen to the Exhibition.

"In fact, the Exhibition Committee urges all mills and firms in associated fields to send not only the top management to the exhibition but also to make a point of having key operating men see the machines, watch them in operation and compare them and their efficiency to the equipment presently used in their own mills," continued Mr. Darrin.

"Persons intending to visit the exhibition are urged to communicate promptly with the Housing Secretary, 16 Central Pier, Atlantic City, New Jersey, for room reservations," he concluded. "While Atlantic City is one of the largest seaside resorts in the world and possesses many fine hotels, facilities are frequently exhausted when exhibitions of the size and

scope of the American Textile Machinery Exhibition are held. It is important that those planning to visit the Exhibition write to the Housing Bureau promptly indicating the number of rooms desired. Applications for rooms will be assigned immediately and acknowledged. Room rates range upwards from $2 a day per person."

Admission to the Exhibition is free to everyone in the textile industry. Tickets may be obtained in any quantity desired by communicating with Albert C. Rau, Manager, Campbell-Fairbanks Expositions, 332 Park Square Building, Boston, Mass., from any of the exhibitors or upon registration at the Exhibition in Atlantic City. Tickets can also be obtained by writing or phoning *American Dyestuff Reporter*, 1 Madison Ave., New York 10, N. Y.

• Hooker Management Changes

Following the annual meeting of stockholders and the board of directors at the company's offices in Niagara Falls, N. Y. on February 14th, several major changes in positions of executives were announced by officers of the Hooker Electrochemical Company.

Hiram B. Young, formerly Superintendent of the Niagara Falls plant, was made Works Manager. Frank W. Dennis, formerly Personnel Director and Employment Manager, was named Director of Industrial Relations for plants at Niagara Falls, N. Y.; Tacoma, Washington; and subsidiary Hooker-Detrex plants at Tacoma, and at Ashtabula, Ohio. Leonard F. Bryant, formerly Assistant Production Superintendent is now Plant Superintendent and Walton B. Scott, formerly Assistant Technical Superintendent is now Technical Superintendent.

Mr. Young joined the Hooker Company in 1935 at the New York office as a member of the Development and Research Department doing research work on the chemical treatment of textiles. In 1937 he came to the plant at Niagara Falls to handle special operating problems, becoming Superintendent in 1941. He is a member of the Chlorine Institute, Inc. Committee on Container Specifications and Safety.

Mr. Dennis has been associated with Hooker since 1916 in various capacities relating to employment and personnel, becoming Personnel Director and Employment Manager in 1927. He is a member of and active in many personnel and industrial relations organizations.

Mr. Bryant has been with the company since 1935 as a supervisor in the Fine Chemicals Department later becoming Assistant Production Superintendent.

Mr. Scott joined Hooker in 1926 as a chemist in charge of the research laboratories and became Assistant Superintendent of Fine Chemicals in 1941.

• C. & C. Personnel News

Robert W. Gaines has been appointed Technical Representative with the Synthetic Fibers Department, Carbide and Carbon Chemicals Division, Union Carbide and Carbon Corporation. Mr. Gaines was transferred to the New York office from the Corporation's plant in South Charleston, W. Va., where he served as Assistant Department Head of Yarn Development.

Mr. Gaines received a B.S. in chemistry from Yale University in 1937 and an M.S. in chemical engineering from Massachusetts Institute of Technology in 1939. He is a member of the American Chemical Society and the American Institute of Chemical Engineers.

Arthur L. Snyder, formerly associated with Burlington Mills as Technical Manager of the Flat Goods Corporation, has joined the Synthetic Fibers Dept. He had previously served for over 23 years in various capacities with the Rayon Department of E. I. du Pont de Nemours and Company, Inc.

Mr. Snyder received a B.A. Sc. in chemical engineering from the University of Toronto in 1923. He is a member of the A.A.T.C.C. and the A.A.T.T.

• Thompson Heads Consumer Goods Committee

Alfred C. Thompson, general manager of Miller and Rhoads, Inc., Richmond, Virginia, has been elected chairman of its Consumer Goods Committee according to an announcement by the American Standards Association. Mr. Thompson represents the National Retail Dry Goods Association on this committee, which is the top technical group in charge of work on national standards for consumer goods.

Mrs. Elizabeth Sweeney Herbert, editor of household equipment, McCall's Magazine, has been elected vice-chairman of the committee. Mrs. Herbert represents the American Home Economics Association on the committee.

Other members of the newly elected Executive Committee are:

Dr. Faith Williams, Chief, Office of Foreign Labor Conditions, Bureau of Labor Statistics, U. S. Department of Labor (representing the American Association

of University Women).

Dr. Jules Labarthe, Jr., Senior Fellow, Mellon Institute (representing the National Retail Dry Goods Association).

Earle M. Edgerton, Director of Technical Control Department, Pacific Mills (representing the National Association of Finishers of Textile Fabrics).

Margaret Scattergood, research staff, American Federation of Labor (representing American Federation of Labor).

Mrs. Edna Brandau of Syracuse University (representing the American Home Economics Association).

Charles L. Condit, Secretary of Engineering and Technical Committee, Society of the Plastics Industries, Inc. (representing the Society of the Plastics Industry, Inc.).

• MacDonald New Houghton President

William F. MacDonald was elected President of E. F. Houghton & Co., manufacturers of industrial oils, leathers and chemicals, at the annual stockholders' meeting held at the company's main offices at 303 W. Lehigh Ave., Philadelphia, on February 14th.

Mr. MacDonald, who will temporarily continue to hold his present office as Treasurer, succeeds Major Aaron E. Carpenter, who voluntarily relinquished the presidency and was elected Chairman of the Board of Directors. Bylaws provide that Major Carpenter shall still remain the chief executive officer of the company. He has been president since 1934 during which period the company's peace-time sales have quadrupled.

Mr. MacDonald, 46, was graduated from Wharton School, University of Pennsylvania, in 1927 and entered the employ of E. F. Houghton & Co. that year as a cost clerk. He has since served as industrial engineer, credit manager and Treasurer (1942). He was also named assistant to the president in 1946.

One new director was elected by the stockholders—Dr. James T. Eaton, Manager of Research, who has been with the company since 1937. Dr. Eaton was formerly a research chemist for National Aniline Division, Allied Chemical & Dye Corp. He received his Ph.D. degree from the University of Illinois in 1934. He has headed Houghton's Research Department since 1946. His chief interest has been in the development of new surface active agents.

Other directors re-elected by the stockholders were: G. W. Pressell, Vice-President; Dr. R. H. Patch, Vice-President—Operations; D. J. Richards, Vice-President—Sales; E. A. Carpenter, Secretary; C. H. Butler, H. B. Fox, and L. D. Holland.

Officers re-elected by the Board include also Charles P. Stock, Asst. Secretary and Miss Marie A. Healey, Asst. Treasurer.

Edmund D. Haigler

• F. & P. Adds Haigler

Edmund D. Haigler has recently joined the Fischer & Porter Organization in Hatboro, Pennsylvania, to work on special customer engineering problems.

Mr. Haigler, a graduate of Harvard Engineering & Business Schools, has over twenty years' experience in industrial instrumentation; with the Chevrolet Division of General Motors, the E. I. du Pont de Nemours & Co., Inc. (Ammonia, Cellophane, Rayon) and the Foxboro Company. He was Manager of Foxboro's Engineering Department for several years, and recently completed a 2-year survey of the mining, milling and smelting industries.

A member of the A.S.M.E., A.I.M.E. and N.S.P.E., Mr. Haigler was on the four-man instrument team which studied German industry for the U. S. Government in 1945.

• DuPont Management Changes

Three management changes in the sales organization of the Du Pont Company's Acetate Division have been announced.

Henry C. Froehling, who has been New York district sales manager or "Orlon" acrylic fiber for the last year, has been transferred to Wilmington as manager of development and promotion of "Orlon" and "Acele" acetate rayon.

Daniel M. Thornton, III, who has been a field research supervisor working on the development of "Orlon" acrylic fiber, has been made manager of the sales development section, reporting to Mr. Froehling.

Frederic C. Allen, who has also been working on the development of "Orlon", becomes assistant district sales manager in the New York office, reporting to Charles M. Wenrich, district sales manager for acetate rayon yarns and "Orlon" acrylic fiber.

• IPR To Sponsor Symposium

A symposium sponsored by the Institute of Polymer Research will be given at the Polytechnic Institute of Brooklyn on Saturday, April 22, 1950 on "Detergents and Detergency."

Speakers and topics are as follows:

10:00 A. M.—Gilbert D. Miles and Leo Shedlovsky (Colgate-Palmolive-Peet Company), "Surface Properties of Mixtures of Surface Active Agents."

11:20 A. M.—Joseph M. Lambert and Herbert L. Sanders (General Aniline and Film Corp.), "Synthetics in Cotton Detergency."

2:15 P. M.—Jack Compton (Institute of Textile Technology, Charlottesville) "The Mechanism of Soiling and Soil Retention of Cotton Fabrics."

3:15 P. M.—Round Table Discussion on "Theory and Practice of Detergency" to be opened by Anthony M. Schwartz (Harris Research Laboratories).

Emery I. Valko will be chairman.

• Bowden Promoted

Charles W. Bowden has been appointed industry manager for textiles for Brown Instruments division of Minneapolis-Honeywell Regulator Company, it was announced by L. Morton Morley, vice president and general sales manager.

OBITUARY

B. C. ALGEO

FUNERAL services were held March 15, 1950, at St. Thomas Church in Philadelphia for Bradley Canfield Algeo, 79. first assistant director of the Philadelphia Textile Institute and founder of the PTI Alumni Association, who died March 12 in Chestnut Hill Hospital, Oreland, Pa.

Mr. Algeo retired in 1940 after 45 years as assistant director and 38 years as president of the Alumni Association. The title of his position was changed to assistant dean shortly before he retired. He joined the PTI faculty in 1892, after his own graduation and was named PTI's first assistant director in 1895.

Mr. Algeo was honored by the Alumni Association at a special testimonial dinner in October 1940, and in June, 1942. retired from the school. Until that time, he was a professor and head of the Department of Fabric Construction, Fabric Analysis and Weave Formation.

He was a mason and rector's warden of St. Thomas' Protestant Episcopal Church. Whitemarsh, Pa. He was school director of Springfield Township, Montgomery County, and treasurer of Oreland Building Association since 1940.

Mr. Algeo is survived by a son, Bradley Canfield, Jr.

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The Wool Bureau for choosing it as its "Favorite Sweater Fashion"...

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50	22¾	30	63.00	63.00
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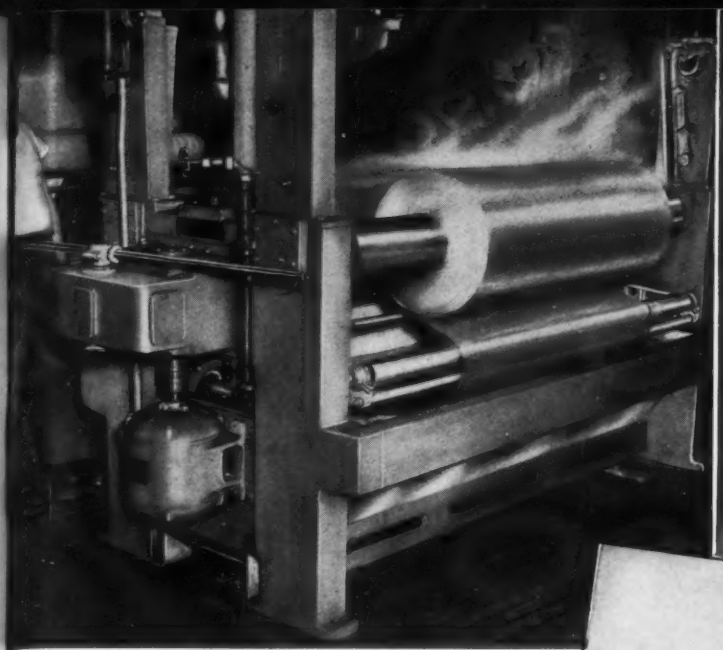

Actual photograph of Van Vlaanderen C.T.* Jig in operation at Vitromar Piece Dye Works, Hawthorne, N. J.

CT* *A New Standard* IN JIG PERFORMANCE

It will pay you to read the letter reproduced here. It gives actual jig room results proving the new Van Vlaanderen C.T.* Jig is the most versatile and rugged jig you can buy today. Better tension control, freer idling, easier and cleaner operation, capacity for larger cloth rolls and better production are all here, allowing you to turn out quality goods at lower cost.

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IMPORTANT FEATURES: New, compact worm type main drive in oil with dry clutches and anti-friction bearings to reduce drag resulting in better tension control. Chains and sprockets completely housed (running in oil) to reduce wear and maintenance and for clean operation. Entire drive system controlled by shifter lever operated from either end. Main drive unit can be dismounted and spare drive unit mounted in half hour. Heavy vibration free cast iron frames, stainless steel tank, 7¼" rubber covered rolls, new overflow arranged sideways, guide rolls stainless steel. Oscillating type expander unit with stainless steel curved bars and immersed rolls. All guide rolls mounted on special stainless steel roller bearings. Better tension control with redesigned malleable iron brakes and tension indicator to permit quick and accurate readings. Other type brakes if desired.

We have made arrangements to show you this machine in actual plant operation. Write us.

Vitromar Piece Dye Works
Hawthorne, New Jersey

Mr. C. H. Van Vlaanderen, President
Van Vlaanderen Machine Company
370 Straight Street
Paterson 3, New Jersey

September 15, 1949

Dear Mr. Van Vlaanderen:

You will be glad to know we are so pleased with the new C. T. Jig which we bought last year that we have decided to order twelve now and expect to order more.

Our jig room has a lot of machines of various makes. From experience we have found that many jigs have limitations — doing good work on one type cloth and not so good on another. We had about resigned ourselves to that condition.

When we began running your new C. T. Jig, we tested it out to see where it would fit in. We were surprised that it seemed to have no limitations — it does superior work on every cloth that can be jig dyed. The results have been universally good on every batch.

Frankly we were doubtful at first that the Van Vlaanderen C. T. would justify its higher original cost. It is only now — after a year of trouble-free service — that we are convinced that the cost is justified. It has operated every week on a 24 hour, six day schedule. In several periods, when the plant was on a seven day week, the C. T. Jig was not idle a single hour for a month's time. Upon inspection of the operating parts we find no appreciable wear and no service required. We expect it to do a big job without maintenance for years to come. We will go out on a limb and say it looks like it will give ten times the usual service before repairs will be necessary.

Yours very truly,

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President

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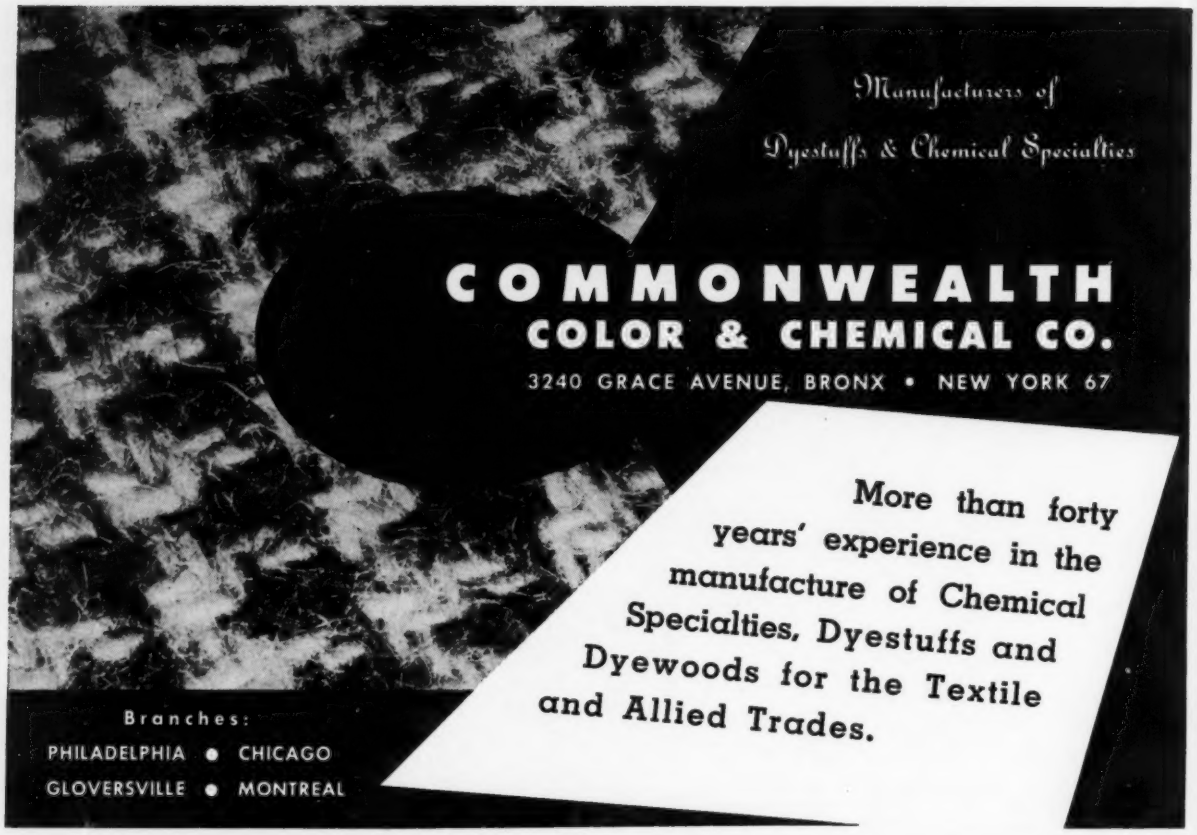

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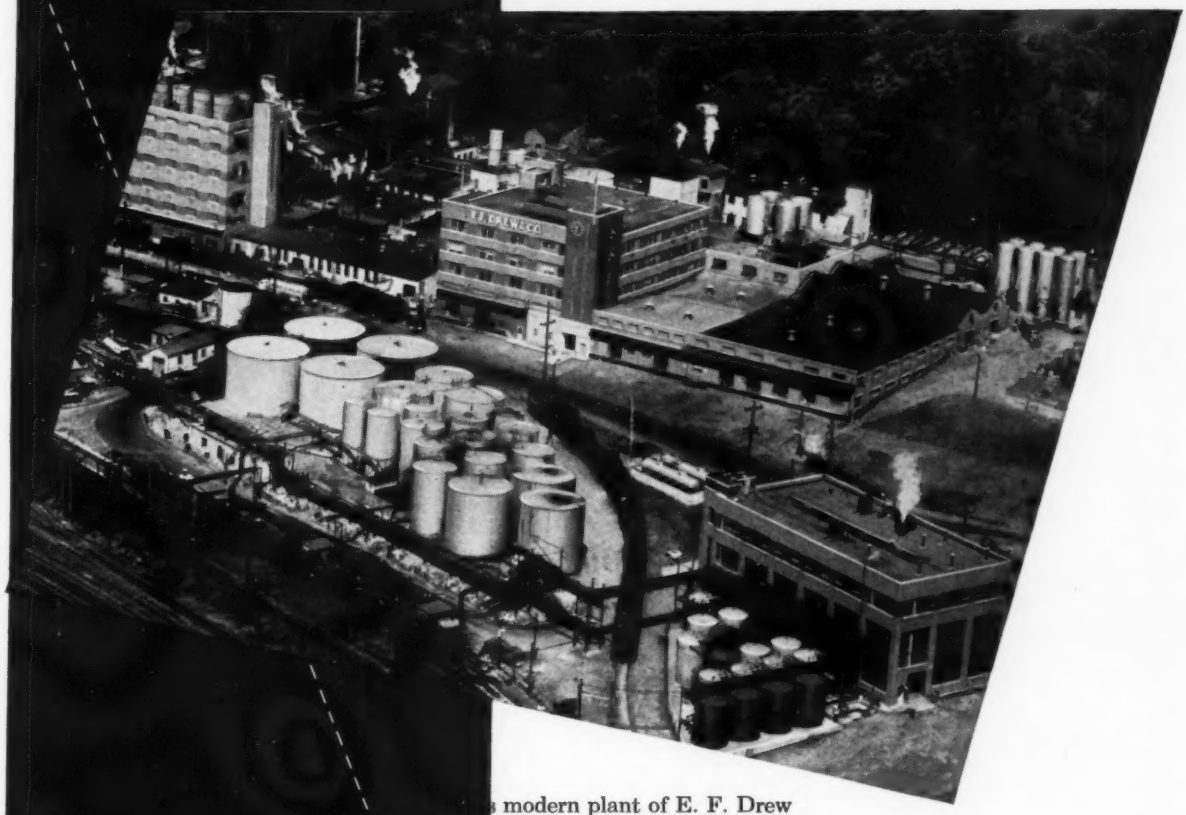

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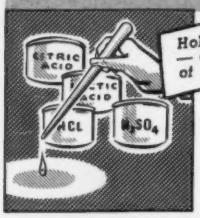

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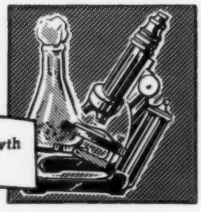

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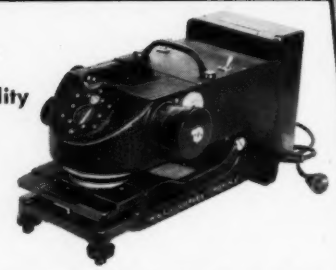

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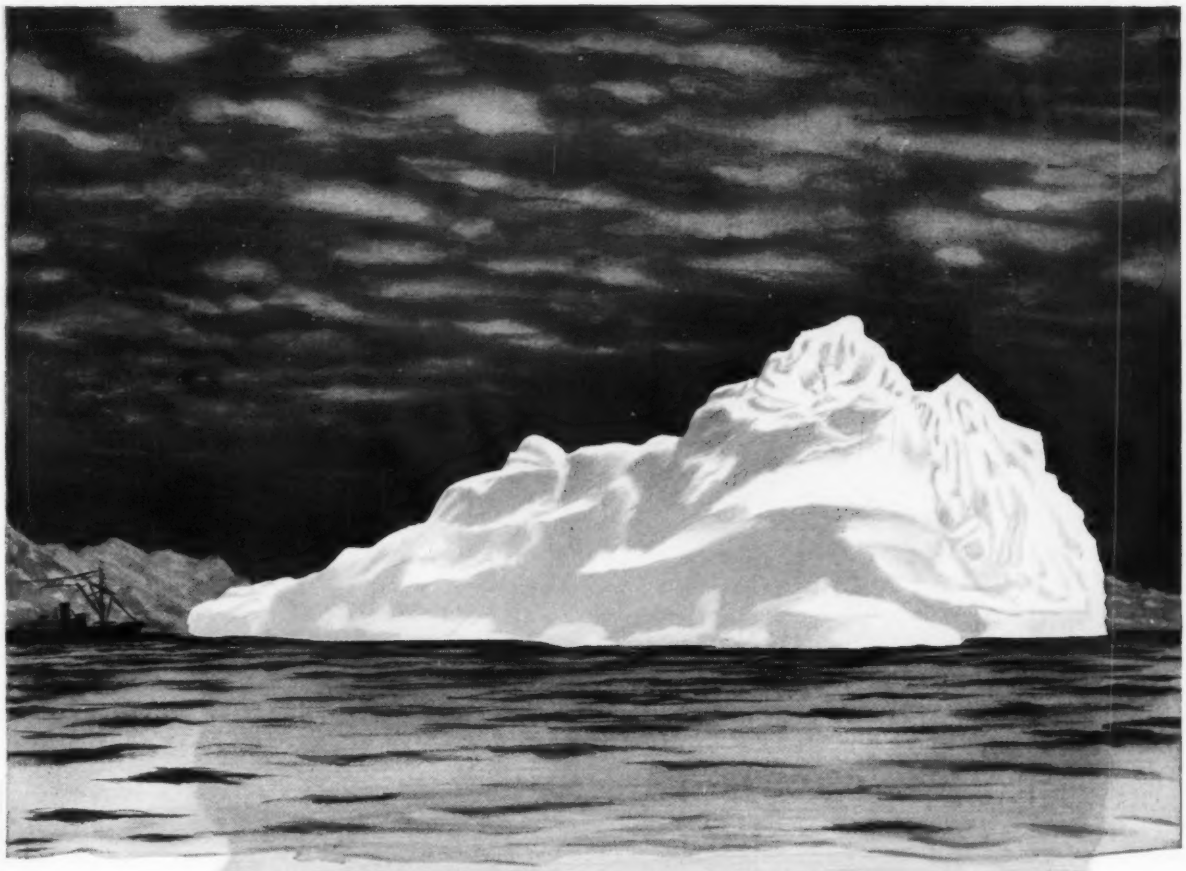

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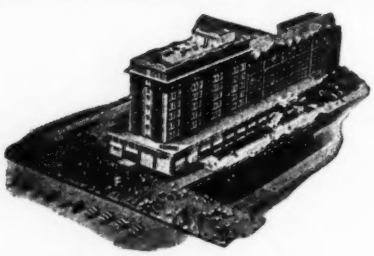

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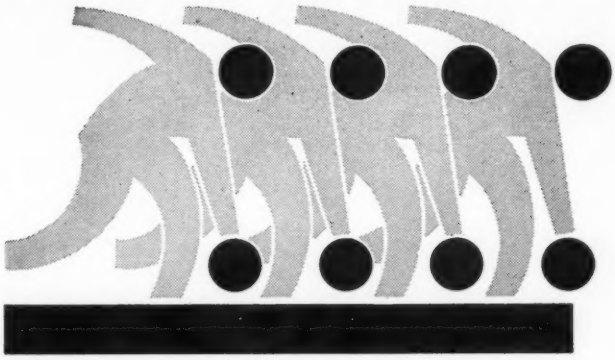

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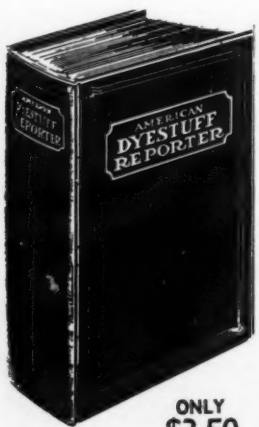

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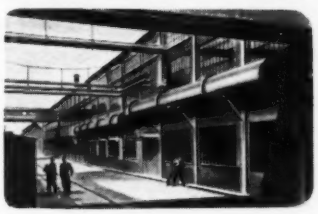
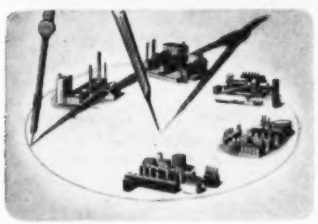
When you specify Solvay in ordering chemicals, you get many advantages that may not be immediately obvious. These hidden "extras" help make your business operate more smoothly, more efficiently...and, in many cases, more economically.

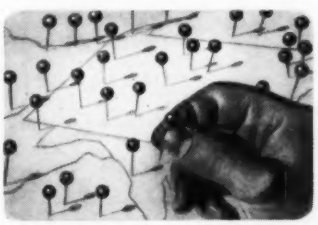
1 To Help You Work out problems—and to offer advice on the proper use, handling and storing of alkalies—there's Solvay "Industry-Wise" Technical Service, a corps of skilled technicians with expert knowledge of individual industries, including *your* industry.



2 Solvay's Long Experience as America's first alkali manufacturer—totaling almost seven decades—assures you of chemical products *exactly* the way they should be.



3 Solvay's Five Huge plants—situated where American industry is centered—guarantees a steady supply of the materials you need.



4 The Convenient, coast-to-coast locations of Solvay's 200 sales offices and warehouses make prompt delivery another feature.

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SOLVAY SALES DIVISION
ALLIED CHEMICAL & DYE CORPORATION
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10 PRODUCTS of PROVEN DEPENDABILITY

WHICH SHOULD WARRANT YOUR ATTENTION

*AQUAROL: A water repellent for processing woolen, cotton and rayon fabrics, also produces excellent results in splashproofing or finishing all types of hosiery.

*PARAMINE T A: A cation active softener for processing cotton and rayon cloth to obtain a soft, smooth, pleasing finish.

ANTHOMINE: Auxiliary used in all wool dyeing processes to produce a uniform shade and impart a soft pleasing hand to stock, yarn and cloth. Improves exhaustion of dye bath and increases color yield. Very effective for levelling shade of tippy and mixed wools.

*PARAPON S A: A highly efficient leveler and softener for dyeing and finishing all types of yarn, cloth and hosiery to produce a uniform dyeing and a soft full hand.

*ARIPEL F S: Finish and gas inhibitor for processing dyed acetate rayon—produces a soft, full feeling finish and prevents gas fading of the color.

*LANITOL F: A synthetic detergent possessing exceptional scouring and washing properties for processing wool, cotton, rayon or nylon.

*ALGEPON V A: Auxiliary used in dyeing vat colors to retard reoxidation of the reduced bath and produce a solid and uniform shade—also effective in stripping vat dyeings.

*CULOFIX: Used as an after treatment in last rinse to prevent bleeding of direct dyed cotton or rayon in water.

*DIAZONOL A C: For boiling out cotton cloth in pressure or open kiers to produce greater absorbency and cleaner material. Excellent for pre-boiling knitted cloth in preparation for chlorine bleach. Also used with good results for boiling out cotton or rayon cloth on the jig.

*TETRANOL: A rapid wetting and penetrating agent. Active in acid, alkaline and salt solutions and not affected by hard water, may be used in all types of dyeing operations to insure positive penetration of color and a uniform and solid shade.

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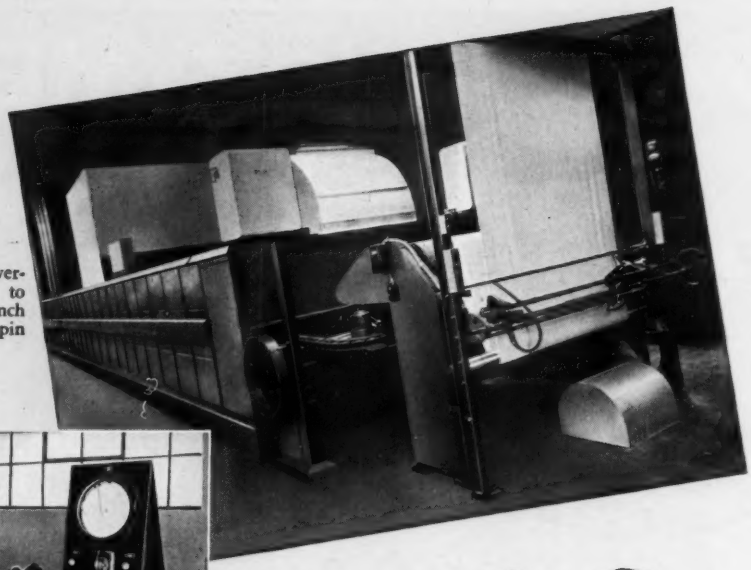

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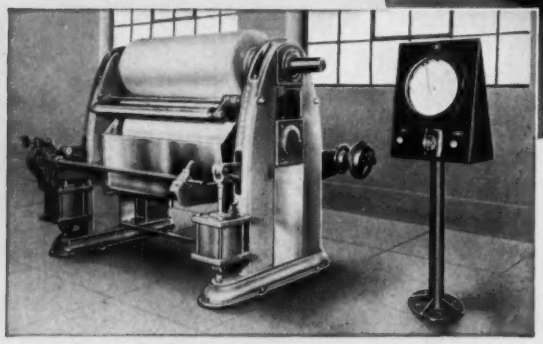
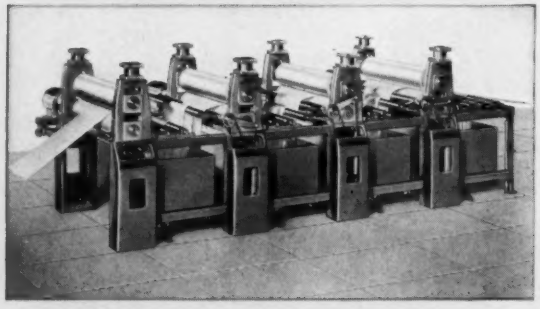
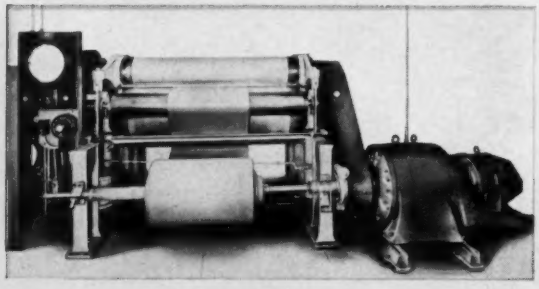


Butterworth "Bullet" Padder. Rolls are interchangeable. Compact in design. Extremely functional in operation.



Butterworth Compartment Washer. Unit type construction. Can be furnished in any multiples of compartments.



Butterworth 2-Roll Embossing Calender. Designed for embossing artificial leather and unsupported film.

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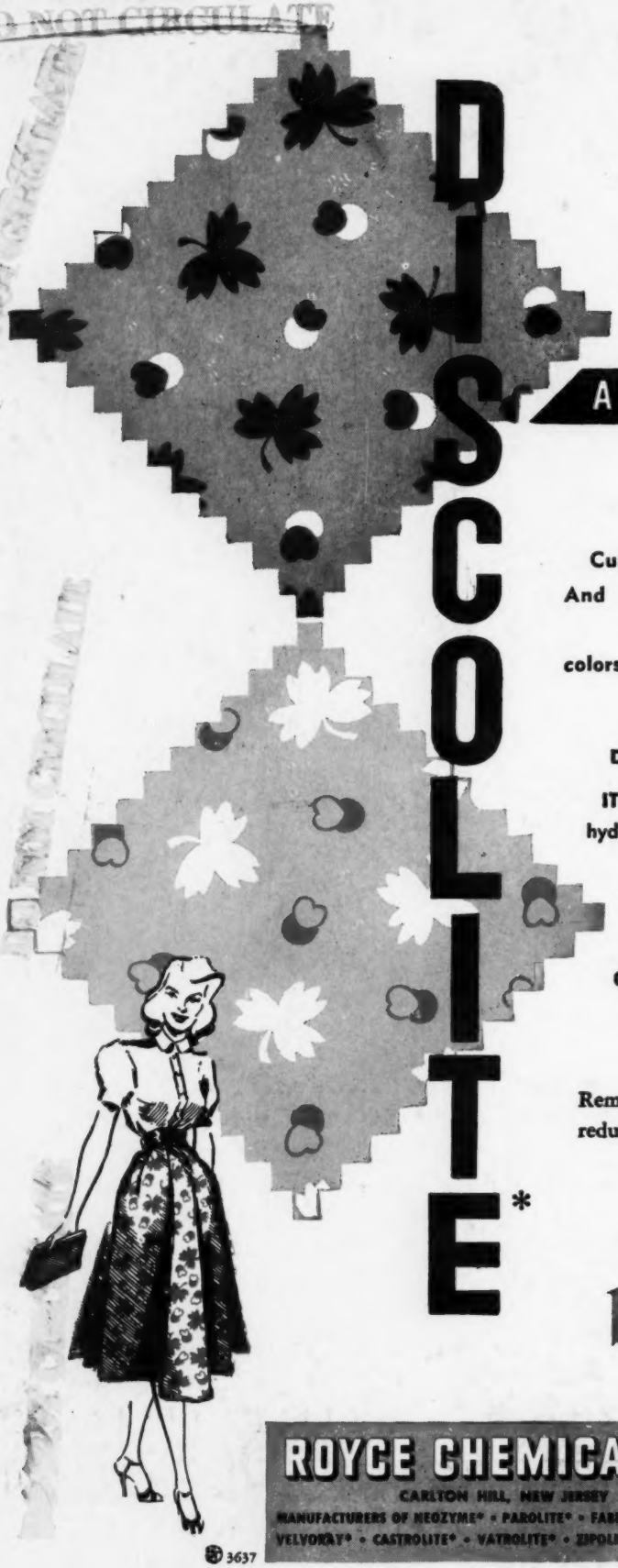

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